DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975

by

James H. Eychaner and others

U.S. Geological Survey

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Metric (SI) units

Most numbers are given in this report in English units followed by metric units in parentheses. The conversion factors used are shown to four significant figures. However, in the text the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the number in English units.

English Units (Multiply)	English Abbreviation	(by)	Metric Units (To obtain)	Metric Abbreviation
Acre-feet	acre-ft	0.001233	Cubic hectometres	hm^3
Feet	ft	.3048	Metres	m
Inches	in	25.40	Millimetres	mm
Miles	mi	1.609	Kilometres	km
Square miles	mi^2	2.590	Square kilometres	km^2

Chemical concentration is given only in metric units--milligrams per litre (mg/l). For concentrations less than 7,000 mg/l, the numerical value is about the same as for concentrations in the English unit, parts per million.

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INTRODUCTION

This report is the twelfth in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, are designed to provide data for interested parties such as legislators, administrators, and planners to keep abreast of changing ground-water conditions.

This report, like the others (see references, p. 16), contains information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing water-table configuration are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of the most important areas of ground-water withdrawal in the State for the calendar year 1974. Water-level fluctuations, however, are described for the period spring 1974 to spring 1975. Many of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1974:

Ground-water conditions in Utah, spring of 1974, by J. C. Stephens and others, Utah Division of Water Resources Cooperative Investigations Report 13.

Ground-water resources of the lower Bear River drainage basin, Box Elder County, Utah, by L. J. Bjorklund and L. J. McGreevy, Utah Department of Natural Resources Technical Publication 44.

Hydrologic reconnaissance of the southern Uinta Basin, Utah and Colorado, by Don Price and L. L. Miller, Utah Department of Natural Resources Technical Publication 49.

Hydrologic reconnaissance of the Wah Wah Valley drainage basin, Millard and Beaver Counties, Utah, by J. C. Stephens, Utah Department of Natural Resources Technical Publication 47.

Map showing the thickness of loosely packed sediments and the depth to bedrock in the Sugar House quadrangle, Salt Lake County, Utah, by E. E. McGregor, Richard Van Horn, and Ted Arnow, U.S. Geological Survey Miscellaneous Investigations Map I-766-M.

Summary appraisals of the nation's ground-water resources--Upper Colorado Region, by Don Price and Ted Arnow, U.S. Geological Survey Professional Paper 813-C.

Water resources of the Curlew Valley drainage basin, Utah and Idaho, by C. H. Baker, Jr., Utah Department of Natural Resources Technical Publication 45.

Water resources of the Milford area, Utah, with emphasis on ground water, by R. W. Mower and R. M. Cordova, Utah Department of Natural Resources Technical Publication 43.

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use, generally can be obtained only in specific areas. The major areas of ground-water development that are discussed in this report are shown in figure 1 and named in table 1. Only a few wells outside of these areas yield large supplies of water of good chemical quality.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contains fractures or other openings enlarged by solution; and sandstone, which contains interconnected openings between the grains that form the rock and may also contain open fractures. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State, in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these sizes. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with debris from the adjacent mountains.

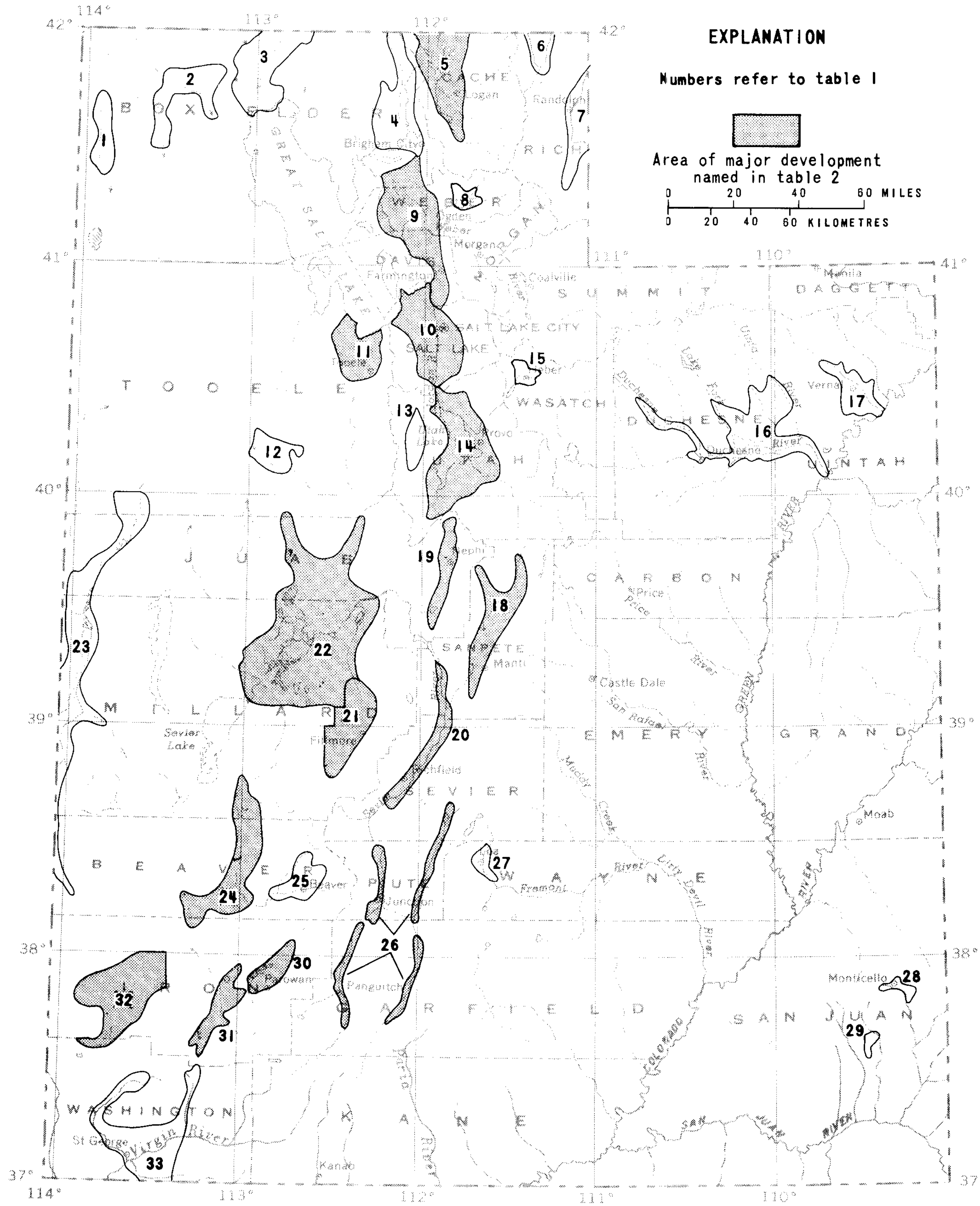

Figure 1.—Areas of ground-water development specifically referred to in this report.

Table 1.--Areas of ground-water development specifically referred to in this report

(Locations are shown in fig. 1)

Area	Principal type of water-bearing rocks
1. Grouse Creek valley	Unconsolidated
2. Park Valley	Do.
3. Curlew Valley	Unconsolidated and consolidated
4. Malad-lower Bear River valley	Unconsolidated
5. Cache Valley	Do.
6. Bear Lake valley	Do.
7. Upper Bear River valley	Do.
8. Ogden Valley	Do.
9. East Shore area	Do.
10. Jordan Valley	Do.
11. Tooele Valley	Do.
12. Dugway area	Do.
13. Cedar Valley	Do.
14. Utah and Goshen Valleys	Do.
15. Heber Valley	Do.
16. Duchesne River area	Unconsolidated and consolidated
17. Vernal area	Do.
18. Sanpete Valley	Unconsolidated
19. Juab Valley	Do.
20. Central Sevier Valley	Do.
21. Pavant Valley	Do.
22. Sevier Desert	Do.
23. Snake Valley	Do.
24. Milford area	Do.
25. Beaver Valley	Do.
26. Upper Sevier Valleys	Do.
27. Upper Fremont Valley	Unconsolidated and consolidated
28. Monticello area	Unconsolidated
29. Blanding area	Do.
30. Parowan Valley	Unconsolidated and consolidated
31. Cedar City Valley	Unconsolidated
32. Beryl-Enterprise area	Do.
33. Central Virgin River area	Unconsolidated and consolidated

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah in 1974 was about 879,000 acre-ft (1,084 hm^3), which was about 165,000 acre-ft (203 hm^3) more than in 1973 and 195,000 acre-ft (240 hm^3) greater than the average annual withdrawal for the period 1964-73 (table 2). Both the increase over 1973 and the increase over the 10-year average were due primarily to changes in withdrawals for irrigation.

Estimated total withdrawals for irrigation in 1974 were about 611,000 acre-ft (753 hm^3), which was about 27 percent more than the 480,000 acre-ft (592 hm^3) withdrawn in 1973 (Stephens and others, 1974, p. 7). Irrigation withdrawals in nearly all the major ground-water areas in Utah were greater in 1974 than in 1973. Only in Cache Valley was there a decrease in ground-water withdrawals for irrigation in 1974. In the East Shore area irrigation withdrawals were unchanged.

The quantity of water withdrawn from wells for irrigation relates closely to local climatic conditions. Precipitation in 1974 was below average throughout most of Utah. Although most areas had average or better snowpacks on March 1, March and May were very dry months (U.S. Department of Agriculture, 1974). Generally below-average spring snowpacks resulted in abnormally low streamflow in many areas during the spring and early summer. The Logan and Beaver Rivers were exceptions, with good snowpacks yielding above-average streamflow. Even in these areas, however, low summer rainfall resulted in low total precipitation for the year.

The decreased availability of surface water in the spring and early summer had a threefold effect on ground-water conditions: ground-water recharge from streams decreased; early spring pumping for irrigation increased, resulting in a longer pumping season; and surface water usage for irrigation decreased resulting in increased demand for ground water during the growing season. In addition, precipitation during the growing season was below average in many of the irrigated valleys, further increasing withdrawals of ground water for supplemental irrigation.

Changes in ground-water levels in Utah from the spring of 1974 to the spring of 1975 reflected the generally decreased availability of surface water and the increase in ground-water withdrawals. Water levels generally fell in most major ground-water basins in the State. Pavant Valley, in central Utah, was the only major ground-water basin in which water levels were generally higher in March 1975 than in March 1974.

The larger ground-water basins and those containing most of the ground-water development in Utah are shown in figure 1 and are listed in table 2. Also listed in table 2 is information about the number of wells constructed and the withdrawal of water from wells in 1974 and, for comparison, total withdrawals in 1973 and average annual withdrawals during the 10-year period 1964-73. The discussions that follow summarize ground-water conditions in areas of major ground-water development.

Table 2.--Well construction and withdrawal of water from wells in Utah

Area	Number in figure 1	Number of wells completed in 1974[1]			Withdrawal from wells (acre-ft)						
		Diameter		Large-withdrawal wells[2]	1974					1973 Total[3]	1964-73 Average annual[4]
		Less than 6 inches	6 inches or more		Irrigation	Industry	Public supply	Domestic and stock	Total (rounded)		
Cache Valley	5	20	20	11	10,500	8,000[5]	3,100	2,000	23,600	24,200	25,700
East Shore area	9	10	14	1	17,500[6]	7,800	24,400	-	49,700	42,500	47,000
Jordan Valley	10	0	31	9	4,600	40,800[7]	51,400	33,500[5]	130,300	128,800	113,600
Tooele Valley	11	0	14	0	28,100[6]	1,000	3,600	100	32,800	29,400	24,000
Utah and Goshen Valleys	14	32	49	3	60,300	13,300	19,800	12,700[8]	106,000	89,000	82,700
Juab Valley	19	0	1	0	30,800	50	10	150	31,000	16,800	20,300
Sevier Desert	22	5	9	1	21,600	800	1,400	1,100	24,900	21,900	26,600
Sanpete Valley	18	1	12	0	13,000	500	700	3,100[8]	17,300	15,900	15,900
Upper and central Sevier Valleys	26,20	5	25	5	12,000	100	1,600	6,100	19,800	19,300	18,900
Pavant Valley	21	0	6	3	100,200	100	400	300	101,000	69,200	76,300
Cedar City Valley	31	0	16	5	39,800[9]	500	1,850	150	42,300	26,800	27,400
Parowan Valley	30	0	5	1	29,500[9,10]	0	1,010	150	30,700	25,600	21,300
Escalante Valley Milford area	24	0	6	5	69,100[9]	300	700	100	70,200	51,600	51,700
Beryl-Enterprise area	32	0	27	8	92,800[9]	0	25	600	93,400	74,000	74,600
Other areas[11]		20	275	49	81,200	5,700	17,800	1,200	106,000	79,300	57,600
Totals (rounded)		93	510	101	611,000	79,000	127,800	61,200	879,000	714,000	684,000

[1] Compiled from data supplied by Utah Department of Natural Resources, Division of Water Rights. Includes deepened and replacement wells.
[2] Wells (6 inches or more in diameter) constructed for irrigation, industry or public supply. Included under "6 inches or more".
[3] From Stephens and others, 1974, p. 7.
[4] Calculated from previous reports of this series. Some figures include unpublished revisions.
[5] Includes some use for fish and fur culture.
[6] Includes some domestic and stock use.
[7] Includes some use for air conditioning.
[8] Includes some use for irrigation.
[9] Data from local water commissioners.
[10] Includes some use for stock.
[11] Withdrawals are estimated minimum amount.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CACHE VALLEY

by W. N. Jibson

Total discharge from pumped and flowing wells in Cache Valley in 1974 was about 23,600 acre-ft (29.1 hm^3) compared to 24,200 acre-ft (29.8 hm^3) in 1973 (table 2). The surface-water supply was especially plentiful in 1974; there was less need for supplemental irrigation from ground-water sources. A marked decrease in the use of water from controlled flowing wells was the major factor in reducing irrigation withdrawals about 14 percent below their 1973 level.

From March 1974 to March 1975 ground-water levels rose by amounts generally less than 2 ft (0.6 m) in the area from Hyrum to Smithfield (fig. 2), where much of the ground-water withdrawal is from flowing wells. The decrease in irrigation withdrawals from these wells accounts in part for the higher water levels in this area. Declines in water levels of as much as 3.5 ft (1.1 m) were observed in other areas of the valley, with the largest declines in the Cub River area from Richmond to the Idaho State line.

The long-term trend of the water level in well (A-12-1)29cab-1, the annual discharge of the Logan River near Logan, and the cumulative departure from average precipitation at Logan are compared in figure 3. Summer base flow from Cache Valley streams was much higher than usual because of above-average snow cover during the previous winter, even though abnormally low precipitation during the summer brought down the annual precipitation to 15.04 in (382 mm) as compared to the 1941-73 average of 17.78 in (452 mm). In contrast, the flow of the Logan River in 1974 was 28 percent higher than the 1941-73 average.

EAST SHORE AREA

by E. L. Bolke

The withdrawal from wells in the East Shore area in 1974 was about 49,700 acre-ft (61.3 hm^3), 7,200 acre-ft (8.9 hm^3) more than that reported for 1973 (table 2). The increase was due chiefly to withdrawal from wells used for public supply and industry.

From March 1974 to March 1975 water levels declined in nearly all the East Shore area (fig. 4) despite slightly above-average precipitation. The declines are due to increased withdrawals from wells used for public supply and industry. The largest declines were in small areas north and west of Ogden, and in a large area in the vicinity of Hill Air Force Base.

The long-term relation between water levels in selected wells and precipitation at Ogden Pioneer powerhouse is shown in figure 5.

JORDAN VALLEY

by R. W. Mower

The withdrawal of water from wells in Jordan Valley in 1973 was 130,300 acre-ft (160.7 hm^3), an increase of 1,500 acre-ft (1.8 hm^3) --about 1 percent--over that in 1973 and 16,700 acre-ft (20.6 hm^3)--about 15 percent--more than the annual average reported for the previous 10 years, 1964-73 (table 2). Withdrawals in 1974 increased slightly over that in 1973 for public supply and for irrigation because of less than average precipitation (fig. 6). Withdrawals decreased slightly for industry but remained about the same for domestic and stock supplies.

Water levels declined from February 1974 to February 1975 in about 70 percent of Jordan Valley (fig. 7) and rose in about 30 percent; the average change in water level in the valley was a decline of 0.2 ft (0.06 m). The maximum observed decline was more than 6 ft (1.8 m) in a small area 2 mi (3 km) west of Riverton. The maximum observed rise was more than 6 ft (1.8 m) in a small area in the north part of Salt Lake City and in a 5 mi^2 (13 km^2) area about 6 mi (10 km) southwest of Kearns. The maximum declines were generally due to increased pumping for public supply and irrigation. The maximum rises occurred in areas where the volume of recharge locally was greater than average and where pumping was less during 1974 than it was during 1973.

The relation between fluctuations of precipitation and water levels in selected wells is illustrated in figure 8. Precipitation at Silver Lake Brighton during 1974 was about 8.0 in (203 mm) below the average for 1931-73. The below-average precipitation and increased pumping locally are reflected by a decline of water levels in four of the five wells.

TOOELE VALLEY

by L. R. Herbert

The withdrawal of 32,800 acre-ft (40.5 hm^3) of water from wells in Tooele Valley in 1974 was 3,400 acre-ft (4.2 hm^3) more than was reported for 1973 (table 2). The increase was due mostly to increased use of ground water for irrigation.

The discharge from springs in 1974 was approximately 24,000 acre-ft (30 hm^3)—an increase of about 7,000 acre-ft (9 hm^3) over the previous year. About 2,000 acre-ft (2.5 hm^3) of springflow was used for irrigation and stock watering in the valley, and about 22,000 acre-ft (27 hm^3) was diverted to Jordan Valley for industrial use.

Water levels declined in much of Tooele Valley from March 1974 to March 1975 (fig. 9) due to below-average precipitation and increased withdrawals during 1974. The greatest declines, more than 4 ft (1.2 m), were in the Grantsville District, where irrigation and municipal wells were pumped to supply large amounts of water. Water levels rose in the eastern and southeastern parts of the valley, with rises of more than 4 ft (1.2 m) observed in the Erda district, possibly due to continuing effects of above-average precipitation in previous years.

The long-term relation between water levels in selected wells and precipitation at Tooele is shown in figure 10. Precipitation at Tooele in 1974 totaled 12.65 in (321 mm), which is 6.24 in (158 mm) less than in 1973 and 3.85 in (98 mm) less than the 1936-73 average. Because of the below-average precipitation, there was a greater demand for ground water, and water levels declined in most of Tooele Valley.

UTAH AND GOSHEN VALLEYS

by R. M. Cordova

Withdrawal of water from wells in Utah and Goshen Valleys in 1974 was about 106,000 acre-ft (131 hm^3), which is the largest withdrawal of record and 17,000 acre-ft (21 hm^3) more than reported for 1973 (table 2). Withdrawals in 1974 were greater than those in 1973 for irrigation, public supply, and industry by 6,400, 5,300, and 5,400 acre-ft (7.9, 6.5, and 6.6 hm^3), respectively. In Utah Valley, 86,000 acre-ft (106 hm^3) of water was withdrawn in 1974, or about 11,900 acre-ft (14.7 hm^3) more than in 1973; in Goshen Valley, 20,000 acre-ft (25 hm^3) was withdrawn in 1974, or about 5,100 acre-ft (6.3 hm^3) more than in 1973.

Water levels in most observation wells declined from March 1974 to March 1975 (figs. 11-15). The general decline resulted from increased ground-water withdrawal and below-normal precipitation (fig. 15).

JUAB VALLEY

by V. L. Jensen

The withdrawal of water from wells in Juab Valley during 1974 was about 31,000 acre-ft (38.2 hm^3), an increase of 14,200 acre-ft (17.5 hm^3) from that reported for 1973 (table 2). This increase was due to below-average precipitation and consequent increased withdrawals for irrigation.

From March 1974 to March 1975, water levels declined throughout most of the valley (fig. 16), though small rises were observed in the southern end. The availability of surface water for irrigation was below average. The decline of water levels was due to increased pumpage and reduced recharge.

The relation of water levels in selected wells and the cumulative departure from average precipitation at Nephi is shown in figure 17.

SEVIER DESERT

by R. W. Mower

The withdrawal of water from wells in the Sevier Desert in 1974 was about 24,900 acre-ft (30.7 hm^3). This amount was 3,000 acre-ft (3.7 hm^3)-- about 14 percent--more than was reported for 1973 and 1,700 acre-ft (2.1 hm) less than the average annual withdrawal for the previous 10 years, 1964-73 (table 2). The increase from 1973 to 1974 was due chiefly to pumpage for irrigation of additional lands that previously were not irrigated or lands that had been fallow the previous year. Withdrawals in 1974 were less than the previous 10-year annual average because surface water was more plentiful than the long-term average. During 1974, discharge of the Sevier River near Juab, the nearest station above all diversions in the Sevier Desert, was about 227,500 acre-ft (281 hm^3), 41,400 acre-ft (51 hm^3) or about 22 percent more than during 1973.

Water levels in both the lower and upper artesian aquifers declined from March 1974 to March 1975 in most parts of the Sevier Desert (figs. 18 and 19). The maximum observed water-level decline in the lower aquifer was 3.7 ft (1.1 m) about 8 mi (13 km) northwest of Delta. Maximum declines observed in the upper artesian aquifer were about 2.8 ft (0.8 m) locally in several places between 10 mi (16 km) northwest of Delta and about 6 mi (10 km) southeast of Delta. A maximum water-level rise of slightly more than 3 ft (0.9 m) was observed in the lower artesian aquifer about 6 mi (10 km) north of Delta and of 4 ft (1.2 m) in the upper artesian aquifer about 4 mi (6 km) north of Oak City.

The long-term relation between precipitation at Oak City and water levels in selected wells is shown in figure 20. Precipitation at Oak City in 1974 was 4.53 in (115 mm) below the 1935-73 average. Water levels declined in all three observation wells from March 1974 to March 1975, indicating that the withdrawal from wells in 1974 exceeded the recharge in most parts of the Sevier Desert.

SANPETE VALLEY

by M. D. ReMillard

Approximately 17,300 acre-ft (21.3 hm^3) of water was withdrawn from wells in Sanpete Valley during 1974 as compared to 15,900 acre-ft (19.6 hm^3) in 1973 (table 2). Withdrawals of water from irrigation wells during 1974 were slightly greater than in 1973 because precipitation was less and less surface water was available for irrigation. There were also increased withdrawals for public supply and industry.

From March 1974 to March 1975 water levels declined in most of Sanpete Valley (fig. 21). Declines of more than 7 ft (2.1 m) were observed in several areas along the eastern half of the valley. Water levels rose in areas along the western side of the valley where little ground water is withdrawn.

Long-term hydrographs of water levels in three wells in Sanpete Valley and the long-term trend of precipitation at Manti are shown in figure 22. Below-average recharge and increased withdrawals are reflected by water-level declines in two of the wells. However, a small rise was observed in one well near Chester, where little ground water is withdrawn.

THE UPPER AND CENTRAL SEVIER VALLEYS

by G. W. Sandberg

The withdrawal of water from wells in the upper and central Sevier Valleys was about 19,800 acre-ft (24.4 hm^3) in 1974, an increase of about 500 acre-ft (0.62 hm^3) from 1973 (table 2). The increased withdrawal was for irrigation and public supplies.

Water levels rose in 3 observation wells, declined in 22 wells, and remained unchanged in 1 well from March 1974 to March 1975 (fig. 23). The largest observed rise, 2.0 ft (0.6 m), was northeast of Richfield, and the greatest observed decline, 9.9 ft (3.0 m), was southwest of Widtsoe.

The relation of water levels in selected wells to discharge of the Sevier River at Hatch and precipitation at Salina and Panguitch is shown in figure 24. Precipitation was 2.93 in (74 mm) and 3.57 in (91 mm) below average at Salina and Panguitch, respectively. Streamflow in the Sevier River at Hatch in 1974 was the third lowest in 35 years of record. The below-average precipitation and streamflow decreased recharge and caused increased use of ground water. These effects are reflected by water-level declines in the observation wells.

PAVANT VALLEY

by C. T. Sumsion

Withdrawal of water from wells in Pavant Valley in 1974 was 101,000 acre-ft (124.6 hm^3), which was the largest withdrawal ever recorded and 31,800 acre-ft (39.2 hm^3) more than reported for 1973 (table 2). The increase was due to more pumpage for irrigation. Precipitation was below average, and less surface water was available for irrigation during 1974.

From March 1974 to March 1975 water levels rose throughout most of the valley (fig. 25). The largest rises were in the area from Holden southward to Kanosh, with maximum rises south of Fillmore and Flowell, and locally south of Hatton. Rises in these areas were due to continued recharge, in excess of pumpage, resulting from above-normal precipitation in previous years. Water levels continued to decline slightly in the western part of the valley where recharge was less than pumpage in 1974.

The relation between water levels in selected wells and cumulative departure from the 1931-74 average precipitation at Fillmore is shown in figure 26. Water levels rose in nearly all observation wells in response to continued recharge in excess of pumpage. However, the water level in the observation well in the Flowell district water-table aquifer declined slightly.

Some of the water pumped for irrigation in Pavant Valley returns to the ground-water system as recharge and is then withdrawn again for irrigation. Such recirculation of ground water affects its chemical quality (Handy and others, 1969, p. D228-D234). The concentration of dissolved solids measured in 1974, in comparison to the most recent earlier measurement, was greater in water from four wells, but less in water from the well in the Flowell district water-table aquifer. However, the trend since at least 1957 is toward increasing concentrations of dissolved solids in parts of the area, as shown in figure 27.

CEDAR CITY VALLEY

by L. J. Bjorklund

During 1974, approximately 42,300 acre-ft (52.2 hm^3) of water was pumped from wells in Cedar City Valley, the largest withdrawal ever recorded. This compares to 26,800 acre-ft (33.0 hm^3) in 1973 (table 2) and 34,900 acre-ft (43.0 hm^3) in 1972 (Bolke and others, 1973, p. 19). The substantial increase in pumpage during 1974 was due to scanty precipitation during the year and the consequent decrease in available surface water for irrigation from streams that enter the valley, principally Coal Creek (see fig. 29).

Water levels in wells declined significantly in virtually all parts of the valley (fig. 28). Declines were greatest on the Coal Creek alluvial fan 2 to 6 mi (3-10 km) northwest of Cedar City and least along the northwestern margin of the valley. Declines of more than 6 ft (1.8 m) occurred in more than 28 mi^2 (73 km^2). Declines were caused mostly by pumping from wells for irrigation and partly by less than normal recharge from streams and areas irrigated with surface water. The decline of water levels during 1974, following a significant rise during 1973, has resulted in ground-water levels similar to those in the spring of 1973.

Changes in water level in an observation well 3 mi (5 km) northwest of Cedar City, cumulative departure from average annual precipitation, annual discharge of Coal Creek, and annual pumpage in Cedar City Valley are shown by graphs in figure 29. The water-level, stream-discharge, and pumpage graphs indicate the effect of below-average precipitation during 1974. The discharge in Coal Creek was less than one fourth of that in 1973, the year of greatest measured discharge.

PAROWAN VALLEY

by L. J. Bjorklund

Approximately 30,700 acre-ft (37.9 hm^3) of water was discharged from pumped and flowing wells in Parowan Valley during 1974 as compared to 25,600 acre-ft (31.6 hm^3) in 1973 (table 2) and 28,000 acre-ft (34.5 hm^3) in 1972 (Bolke and others, 1973, p. 20). The increase in withdrawals over the preceding year resulted from a long, dry growing season, less than average precipitation during the year, and a consequent decrease in surface water available for irrigation in streams that enter the valley, principally Parowan Creek.

Most water levels in the valley declined between March 1974 and March 1975. Declines of more than 7 ft (2.1 m) took place in an area of about 10 mi^2 (26 km^2) on the Parowan Creek alluvial fan north and west of Parowan (fig. 30). Declines of more than 3 ft (0.9 m) occurred in about 30 mi^2 (78 km^2). Water levels declined about 1 ft (0.3 m) in the Buckhorn Flats area in the northern part of the valley. Water levels in 1974, however, declined less than they rose in 1973, so that ground-water levels in March 1975 were slightly higher than they were in March 1973.

Water levels declined in 1974 largely as the result of pumping from wells for irrigation during a long, dry growing season. Withdrawals were greater than for any previous year (fig. 31). In addition to the effects of record withdrawals, below-average precipitation and streamflow resulted in less than average recharge to the ground-water reservoir.

The long-term relation of water levels in an observation well near Paragonah, precipitation, and withdrawals from wells in the valley are shown in figure 31. The graphs show that precipitation has been above average during most years since 1960, but that it was below average in 1974. Withdrawals from wells, however, have increased fairly regularly since 1960 and reached a maximum in 1974. The hydrograph of well (C-34-8)5bca-1 shows the effects of climate more than it does pumping, as the well apparently is little influenced by drawdown in the heavily pumped area.

ESCALANTE VALLEY

Milford area

by R. W. Mower

The withdrawal of water from wells in the Milford area in 1974 was about 70,200 acre-ft (86.6 hm^3), the largest annual withdrawal ever reported. It was 18,600 acre-ft (22.9 hm^3)--about 36 percent--more than was reported for 1973 and 18,500 acre-ft (22.8 hm^3) more than the average annual withdrawal for the previous 10 years, 1964-73 (table 2). The increase was due chiefly to an increase in pumpage for irrigation because less surface water was available than in 1973. During 1974, discharge of the Beaver River at Rockyford Dam near Minersville (fig. 33) was about 33,400 acre-ft (41.2 hm^3), which was about 11,800 acre-ft (14.5 hm^3)--about 26 percent less than during 1973, but about 7,700 acre-ft (9.5 hm^3)--about 30 percent--more than the annual average for 1932-73.

Water levels declined from March 1974 to March 1975 in about 97 percent of the Milford area (fig. 32); the average change in water level in the area was a decline of 1.2 ft (0.37 m). The maximum observed decline was slightly more than 6 ft (1.8 m) in a small area about 2 to 4 mi (3-6 km) south-southeast of Milford. The maximum observed rises were as much as 2 ft (0.6 m) in about 3 percent of the area extending for about 8 mi (13 km) west and northwest of Minersville. The major declines from March 1974 to March 1975 were due to increased pumping for irrigation and to reduced recharge from canals and fields irrigated with surface water. Water levels rose in areas where recharge was greater than normal due to greater than normal seepage losses from canals and fields irrigated entirely with surface water.

The relations between water levels in well (C-29-10)6ddc-2 near the middle of the pumped area, precipitation at Milford airport, discharge of the Beaver River, and ground-water withdrawals are shown in figure 33. Precipitation at Milford airport in 1974 was 2.01 in (51 mm) below the 1932-73 average. The decline of water levels caused by the increased withdrawals and the decreased availability of surface water is represented by the water-level decline in well (C-29-10)6ddc-2.

Beryl-Enterprise area

by G. W. Sandberg

The withdrawal of water from wells in the Beryl-Enterprise area in 1974 was about 93,400 acre-ft (115.2 hm^3), the largest annual withdrawal ever recorded. This is an increase of 19,400 acre-ft (23.9 hm^3) or 26 percent, compared to the amount reported in 1973 (table 2). The increase was due to increased pumpage for irrigation. Withdrawals from wells for other uses remained about the same as in 1973.

Water levels declined throughout the entire area (fig. 34). The declines generally were larger than annual declines during previous years and were probably caused by the record-high pumpage in 1974. The largest observed decline, 16 ft (4.9 m), was in a well about 1½ mi (2.4 km) northeast of Enterprise.

The long-term relation between water levels in selected wells, precipitation, and pumpage for irrigation is shown in figure 35. The water level in well (C-35-17)25dcd-1 declined at about the same rate from March 1974 to March 1975 as during most previous years. Water-level declines, however, were generally larger toward the southern end of the valley. Below-average precipitation--the least since 1966--contributed to the need for increased pumping, which in turn caused water levels to decline more rapidly.

Figure 36 shows the change in concentration of dissolved solids in the water from three wells. The concentration decreased in 1974 in well (C-34-16)28dcc-2 in the northern part of the pumped area, but increased in wells (C-36-16)5a-9 in the central part and (C-37-17)12bdc-1 in the southern part of the area where pumping is greatest. The increases were probably caused by continued recycling of irrigation waters.

OTHER AREAS

by L. R. Herbert

The withdrawal of water from wells in areas of Utah outside the major developed ground-water basins was about 106,000 acre-ft (131 hm^3) in 1974. This amount is about 27,000 acre-ft (33 hm^3) more than reported for 1973 (table 2). The increased use of ground water was due to the below-average precipitation over most of the State and the completion of more large withdrawal wells.

From March 1974 to March 1975 water levels declined and precipitation was below average in the Grouse Creek, Curlew, upper Bear River, lower Bear River, Bear Lake, Cedar, Beaver, upper Fremont, Heber, and Snake Valleys, and in the Dugway and Vernal areas (fig. 37).

Water levels declined and precipitation was above average in the central Virgin River area. Water levels rose and precipitation was above average in the Monticello and Blanding areas. Water levels rose and precipitation was below average in Park and Ogden Valleys and the Duchesne River area (fig. 37).

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ILLUSTRATIONS

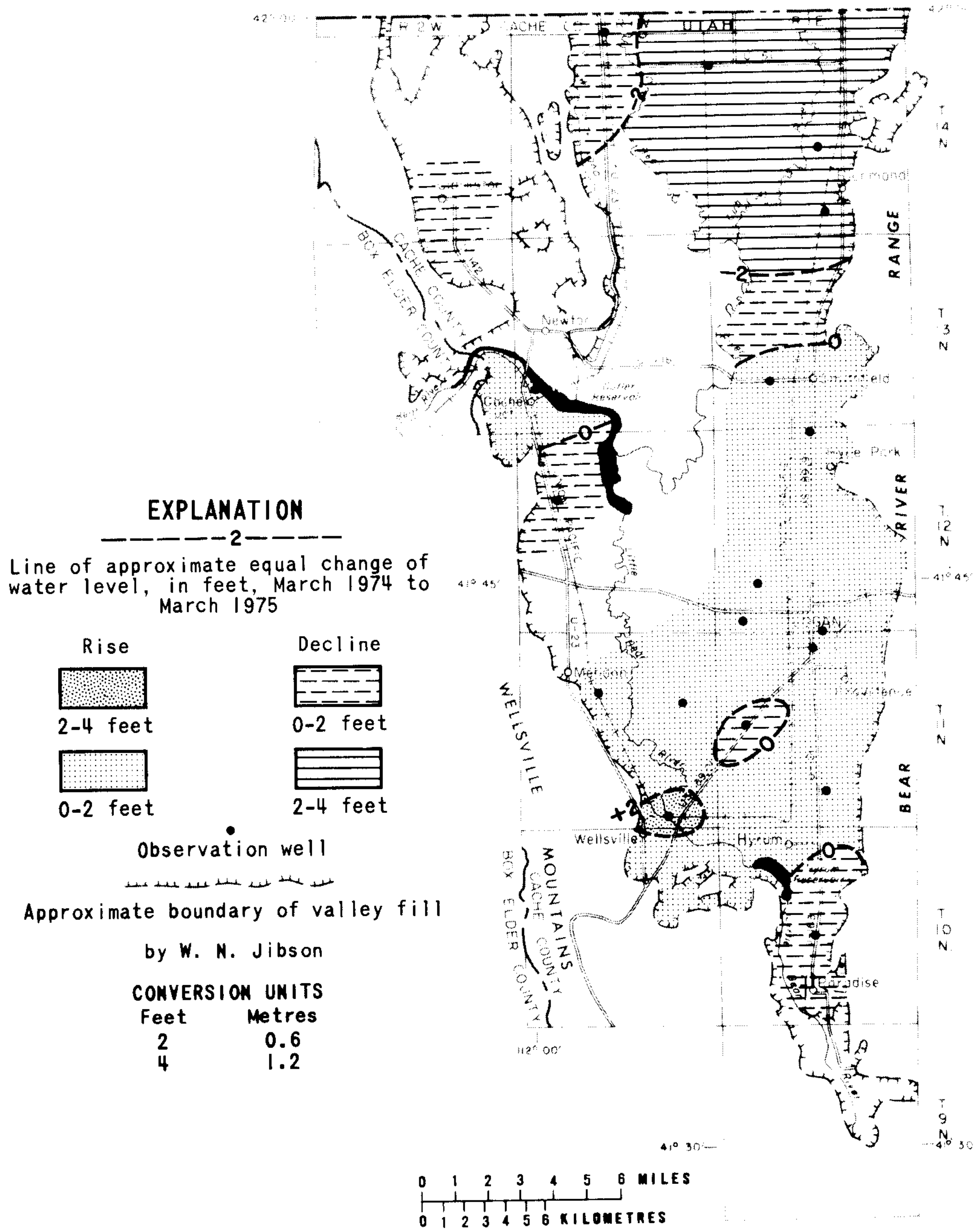


Figure 2.—Map of Cache Valley showing change of water levels from March 1974 to March 1975.

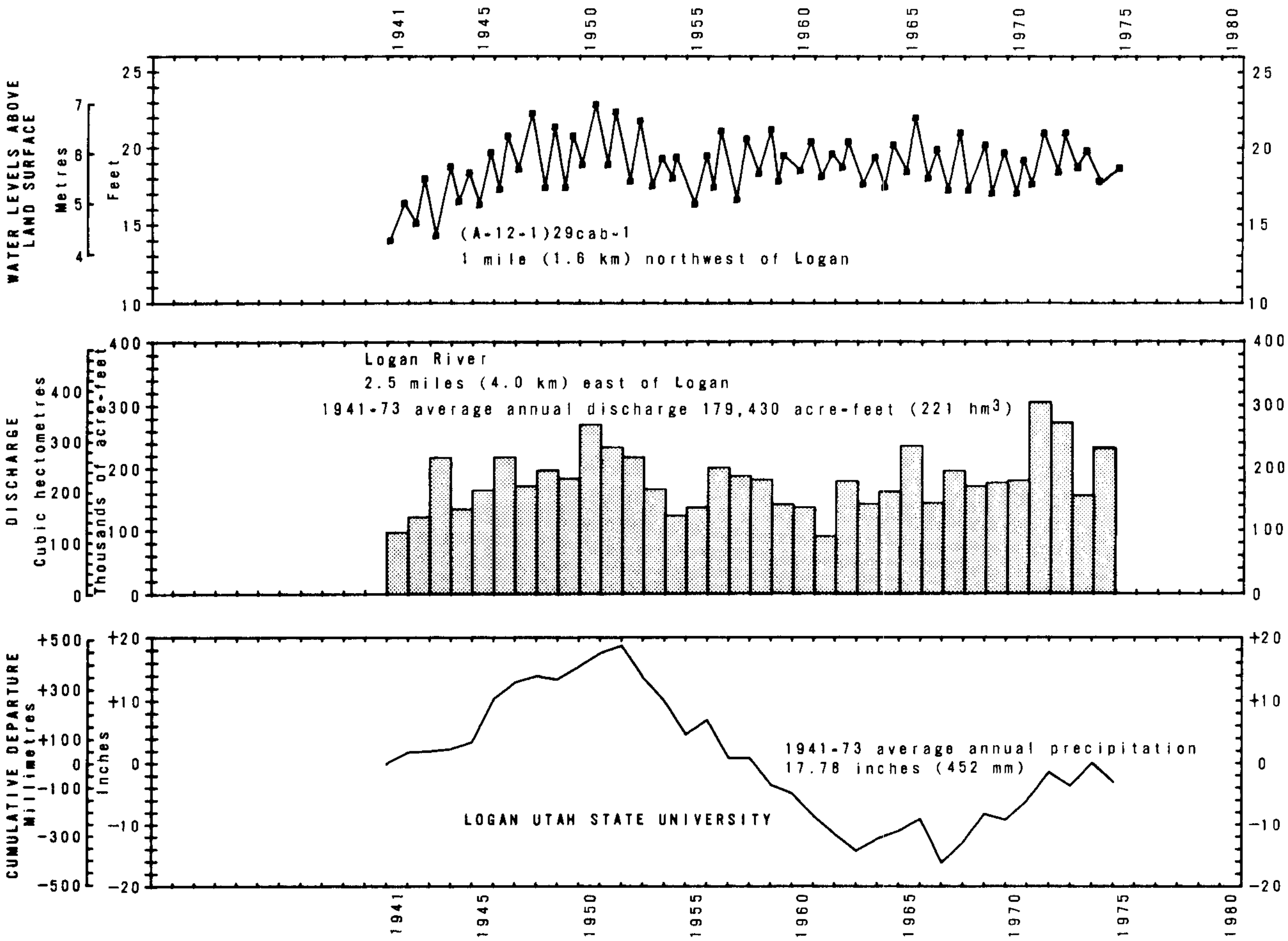


Figure 3.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan and to cumulative departure from the average annual precipitation at Logan Utah State University.

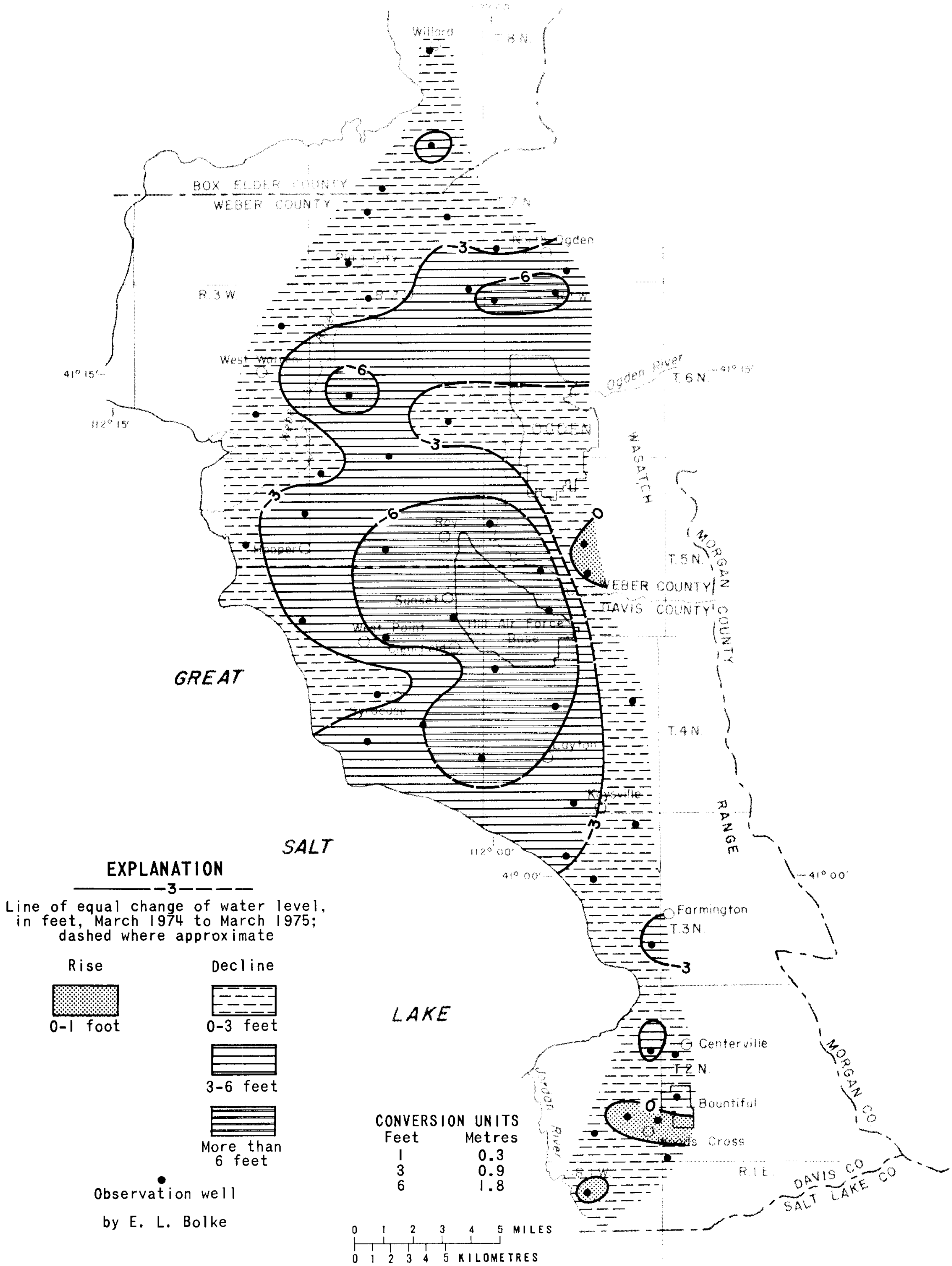


Figure 4.—Map of the East Shore area showing change of water levels from March 1974 to March 1975.

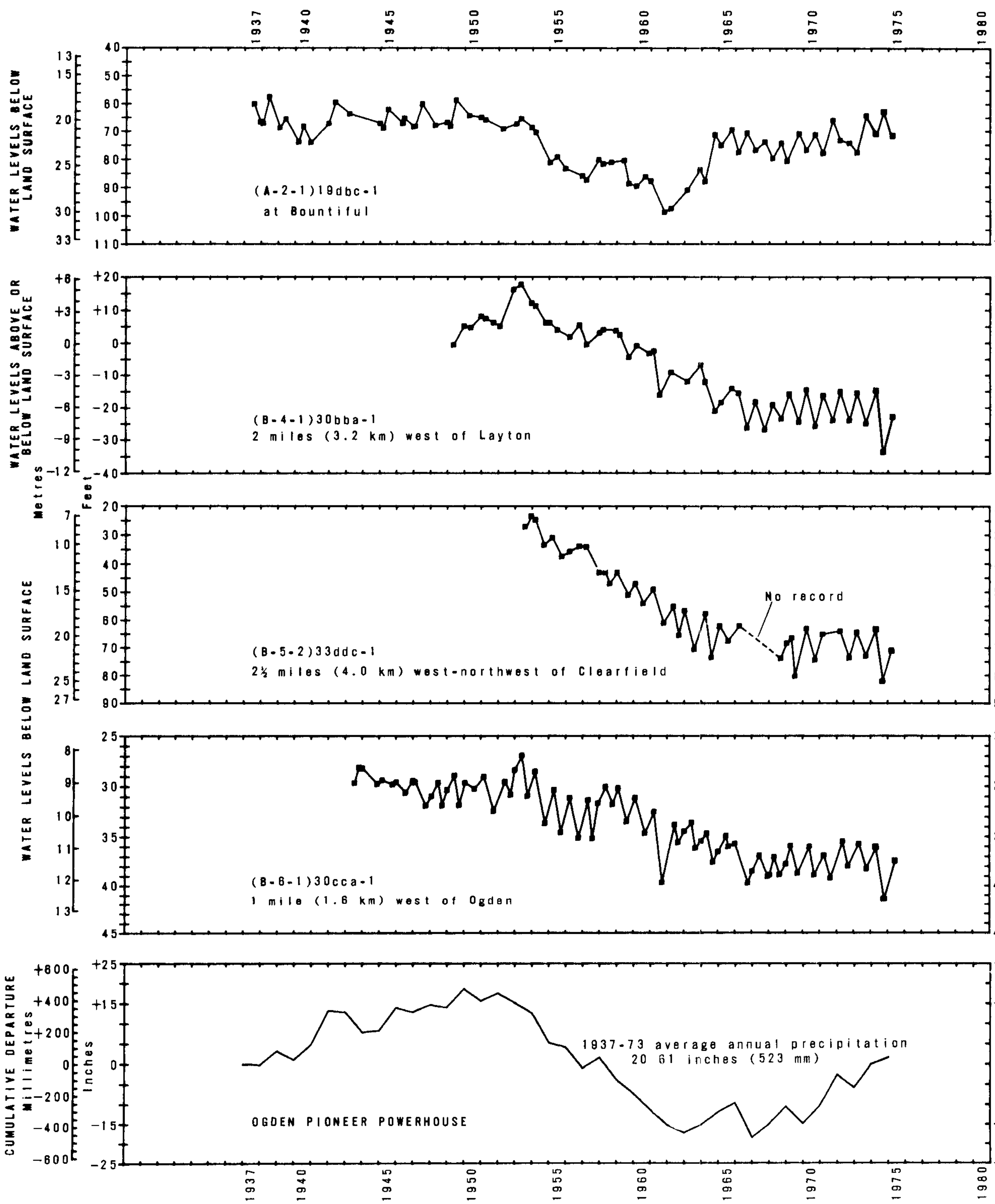


Figure 5.—Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse.

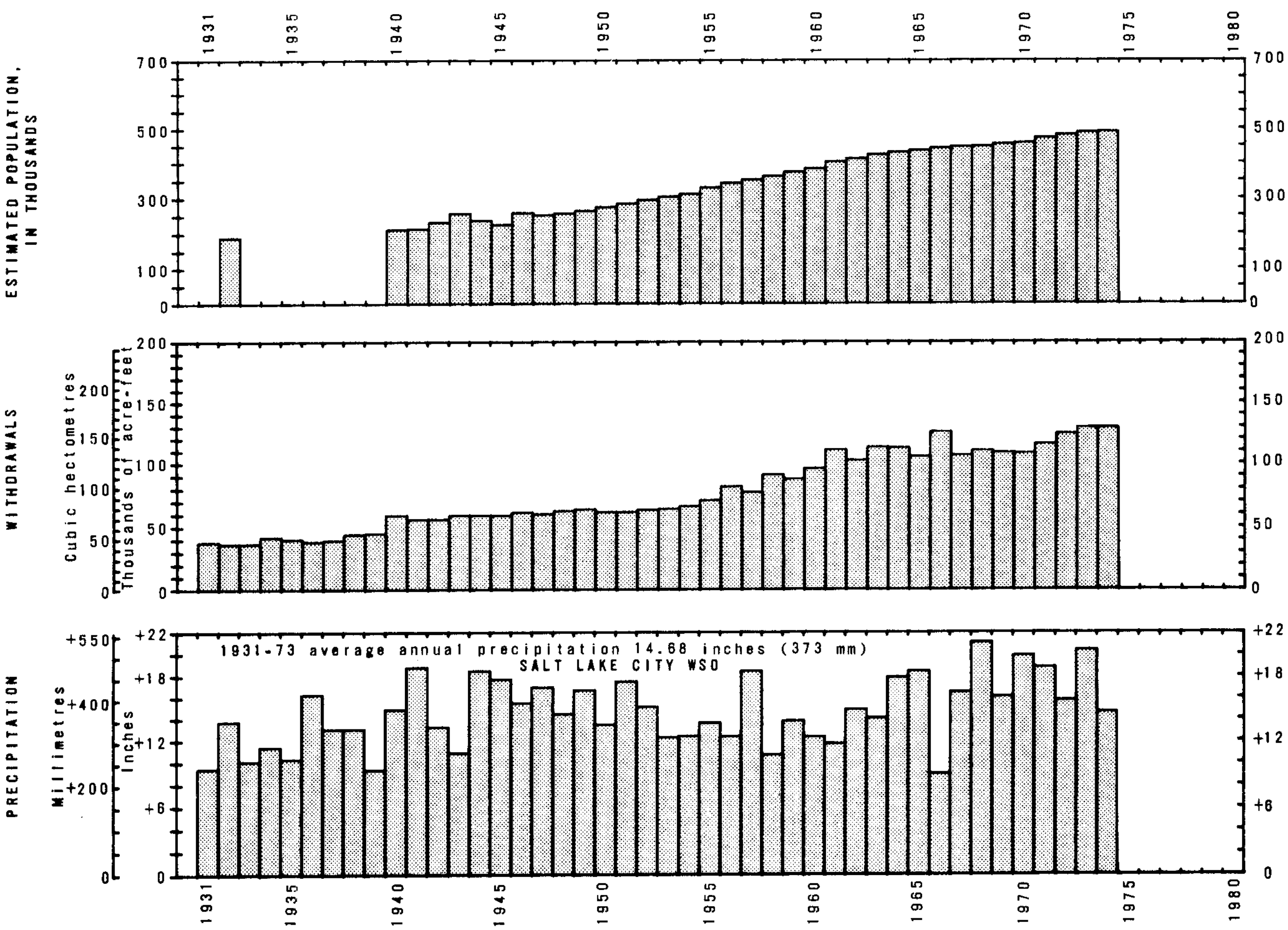


Figure 6.—Graphs showing estimated population of Salt Lake County, withdrawals from wells, and annual precipitation at Salt Lake City WSO (International Airport) for the period 1931-74.

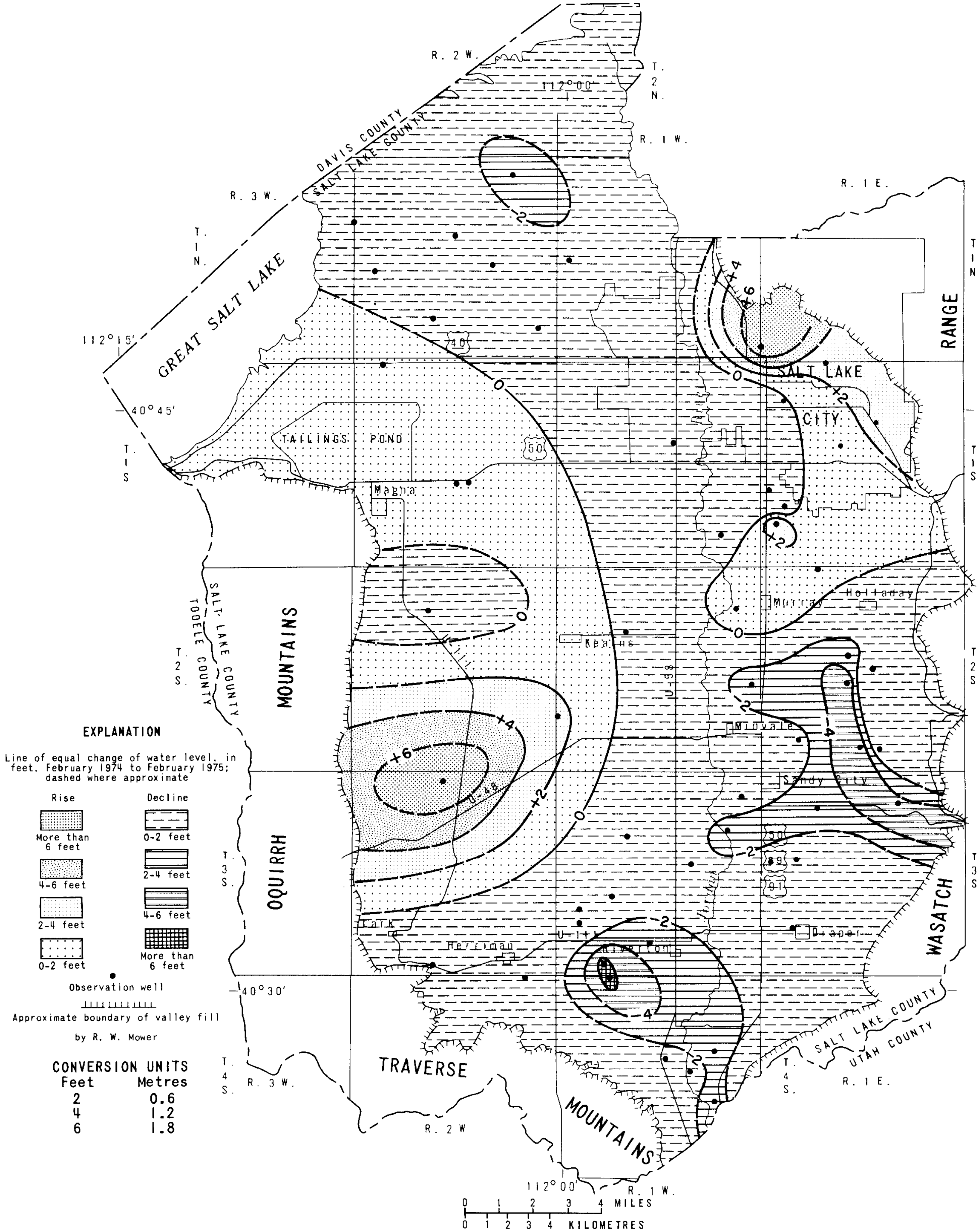


Figure 7.—Map of the Jordan Valley showing change of water levels from February 1974 to February 1975.

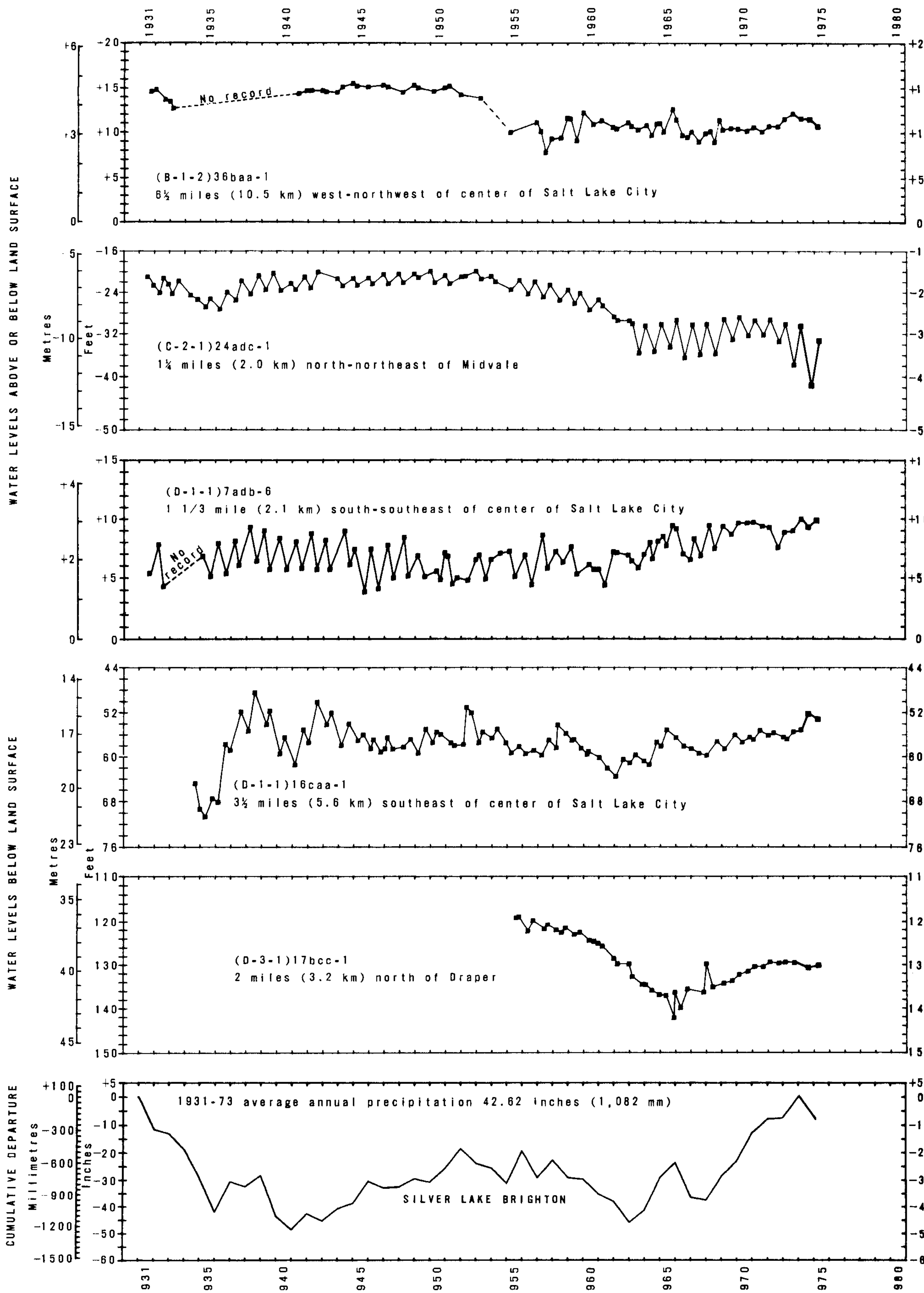


Figure 8.— Relation of water levels in selected wells in the Jordan Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

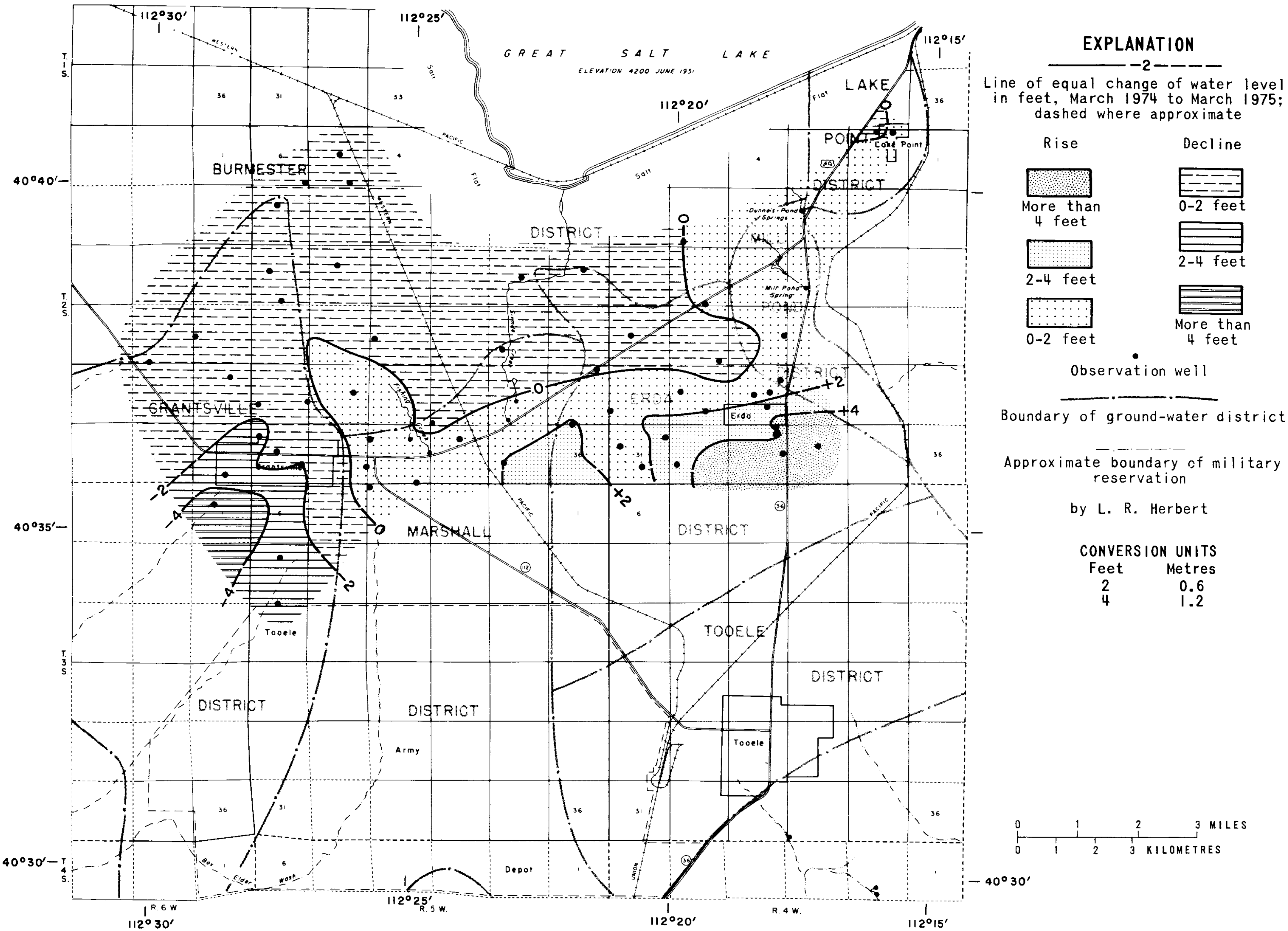


Figure 9.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1974 to March 1975.

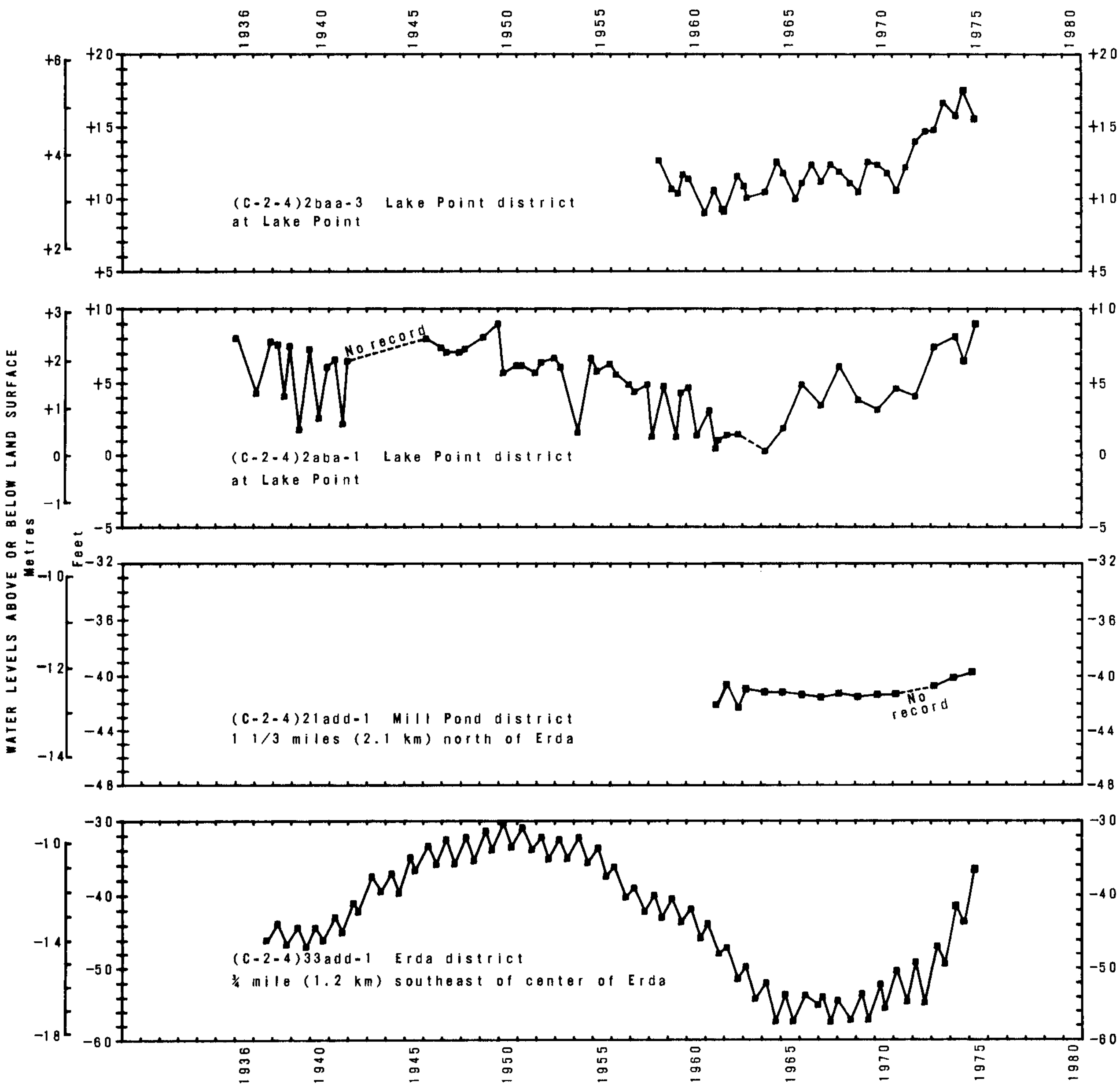


Figure 10.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele.

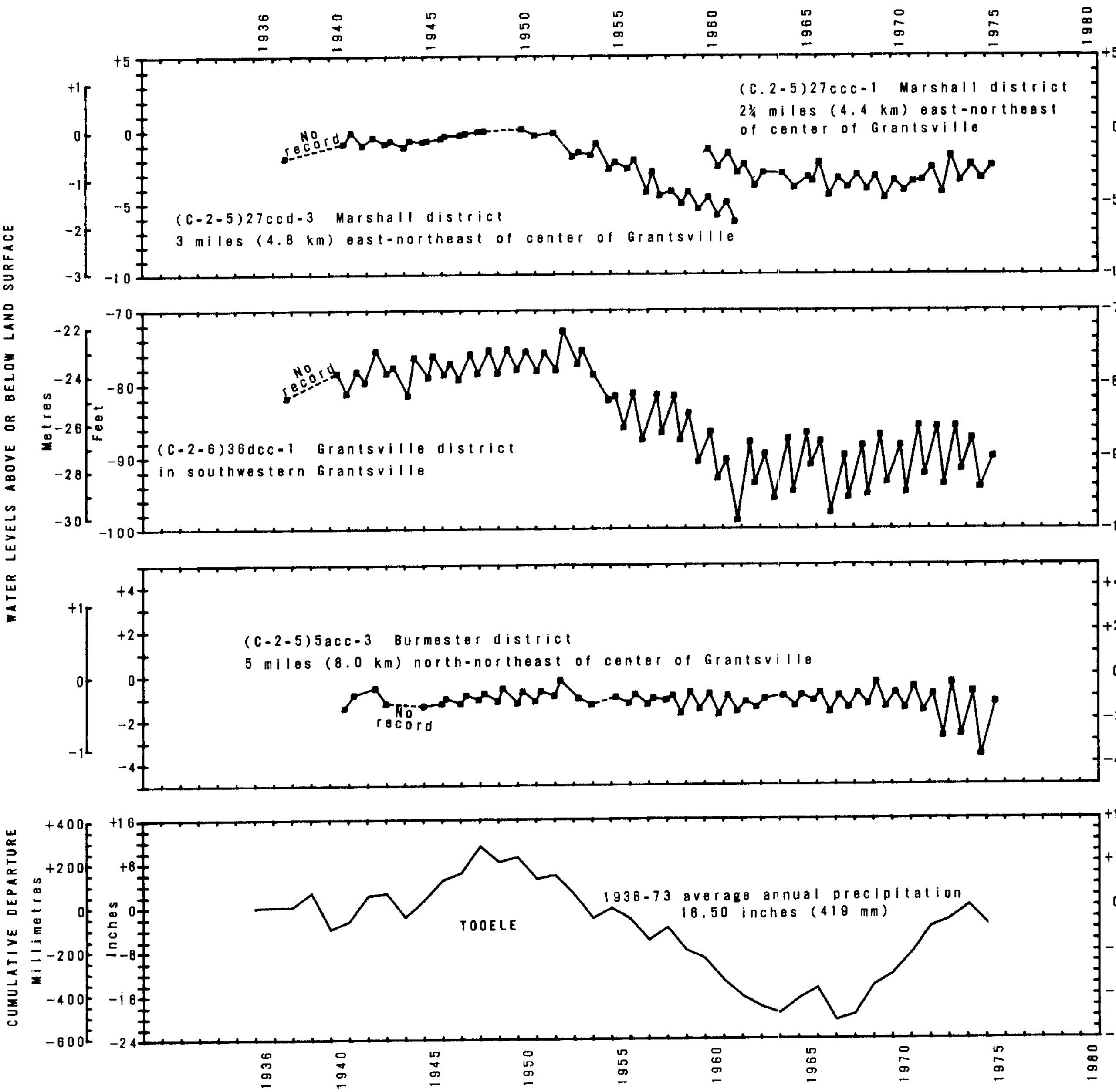
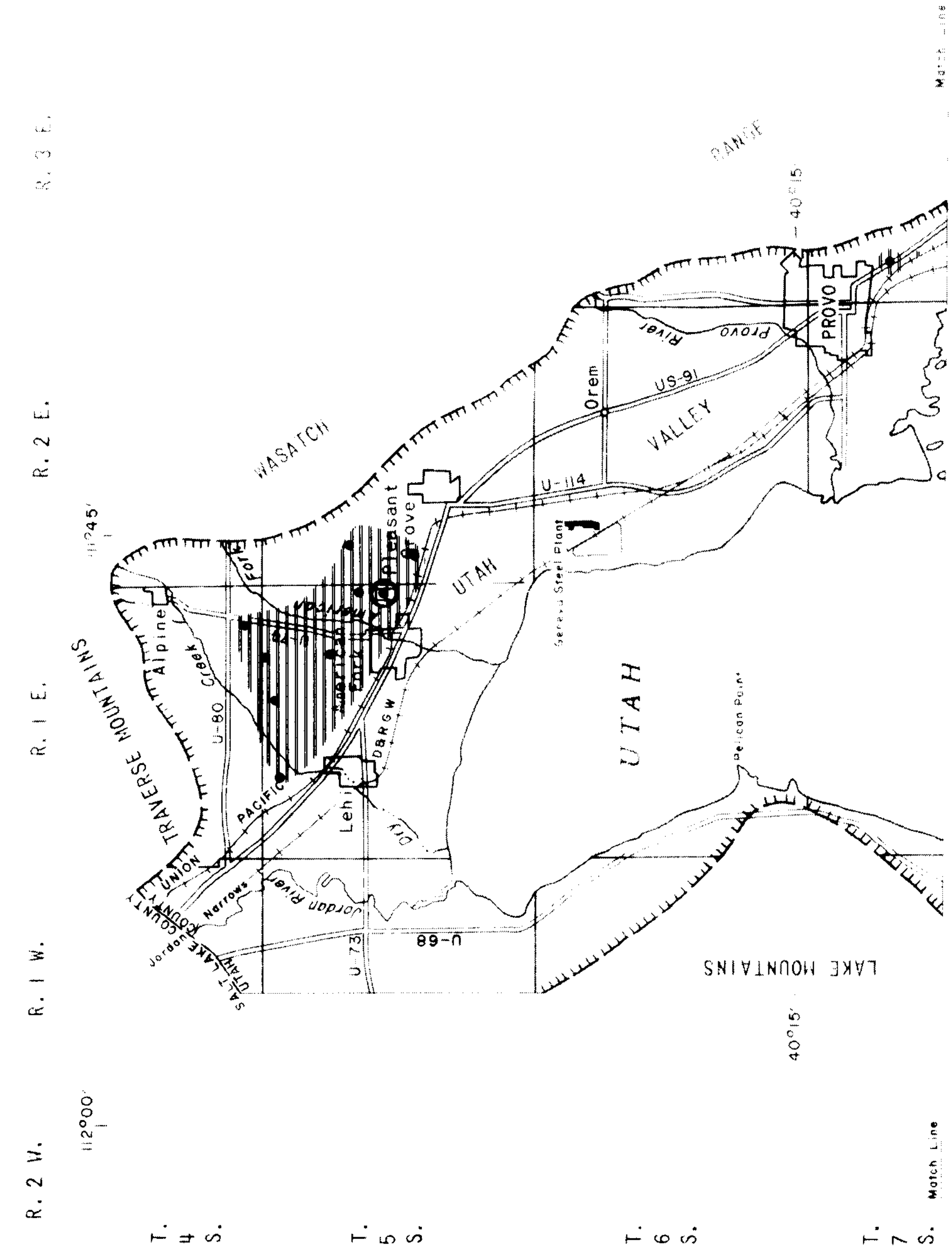


Figure 10.— Continued.



R. 2 W.
R. 1 W.
R. 1 E.
R. 2 E.
R. 3 E.
T. 4 S.
T. 5 S.
T. 6 S.
T. 7 S.
112°00'
111°45'
40°15'
Match Line
TRAVERSE MOUNTAINS
WASATCH
RANGE
LAKE MOUNTAINS
UTAH
UTAH VALLEY
Alpine
Lehi
Orem
PROVO
Provo River
Jordan River
Jordan Narrows
Geneva Steel Plant
Pelican Point
UNION PACIFIC
D&RGW
US-91
U-114
U-80
U-73
U-68
SALT LAKE COUNTY
UTAH COUNTY

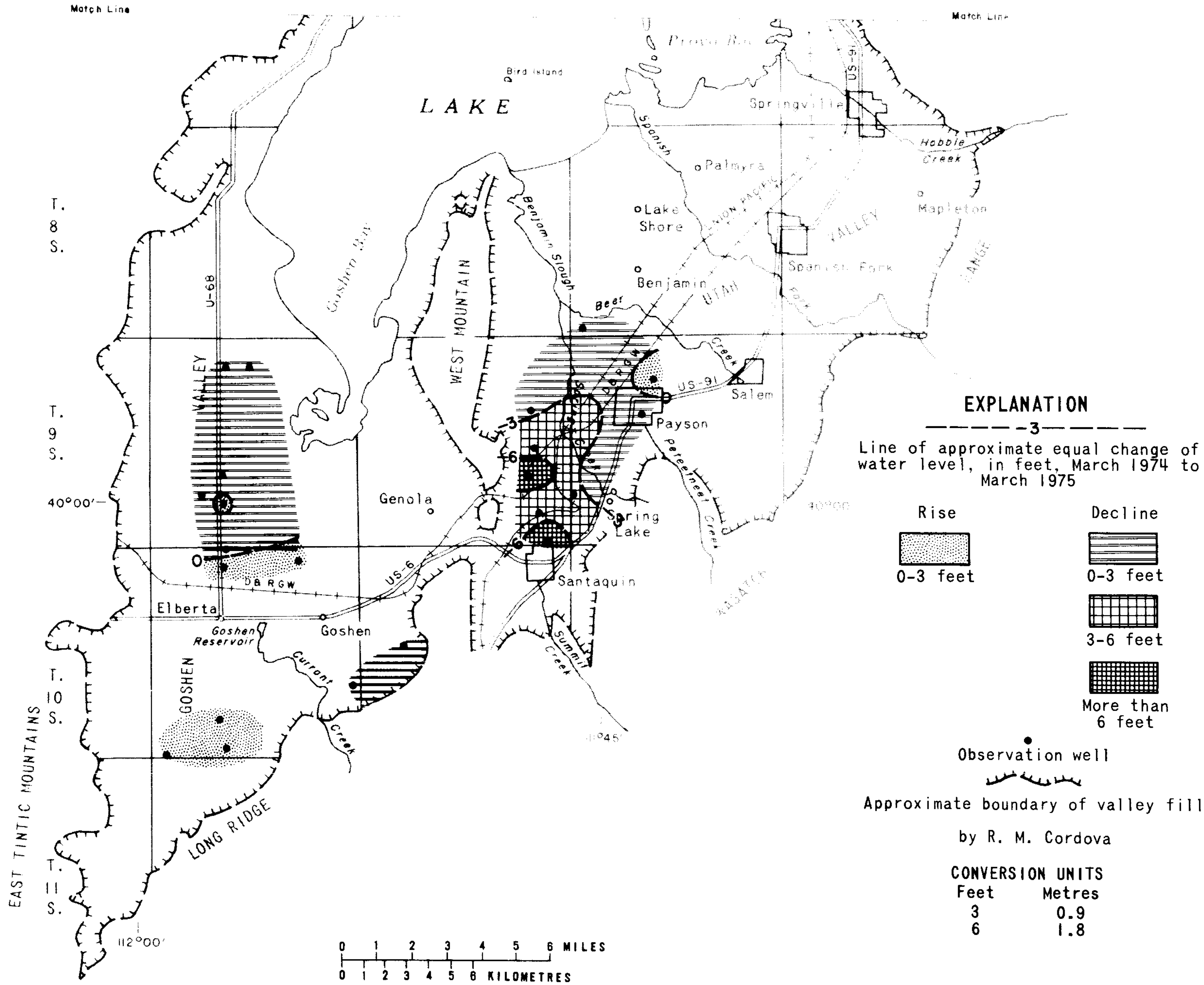


Figure 11.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1974 to March 1975.

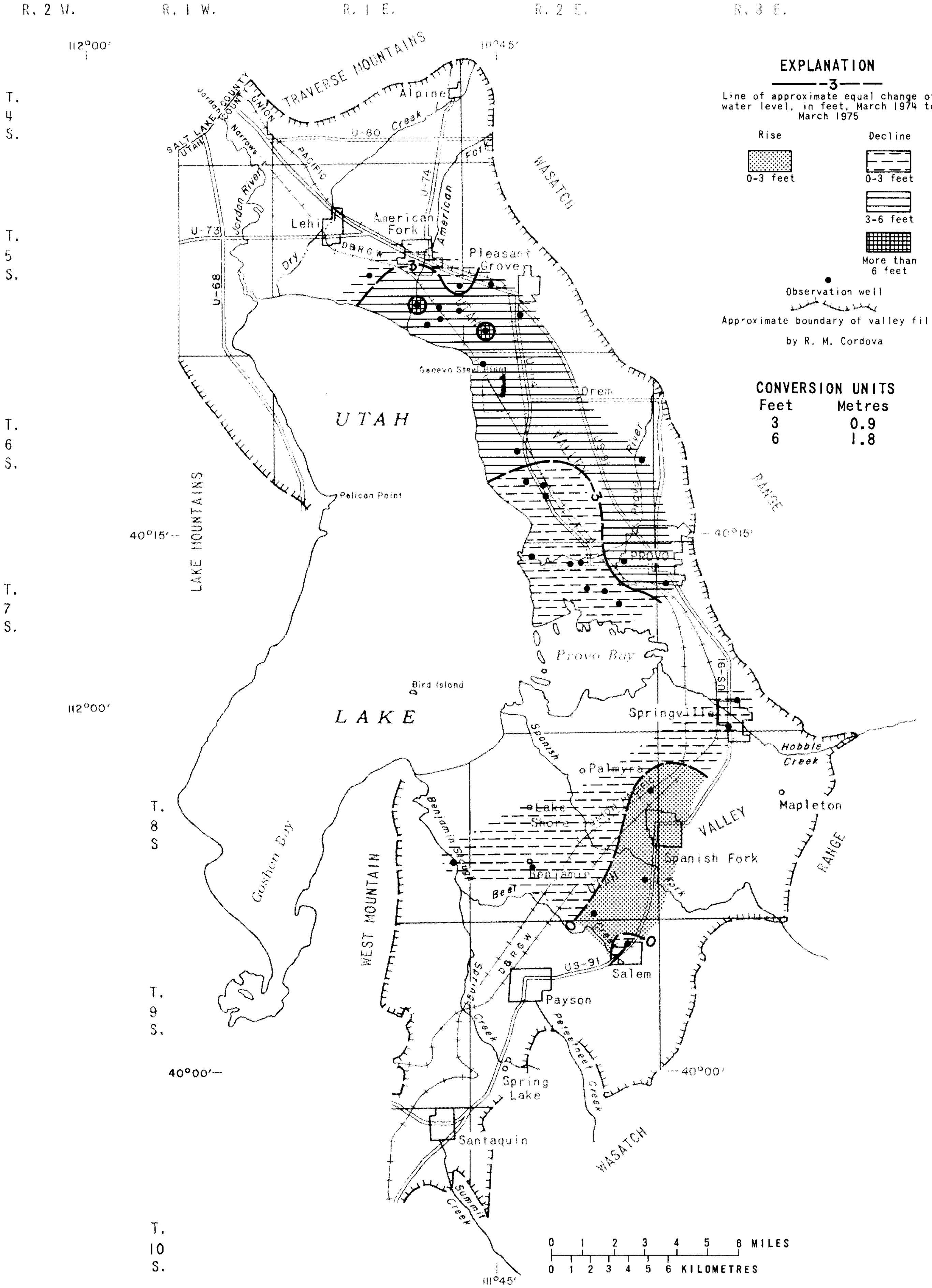


Figure 12.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1974 to March 1975.

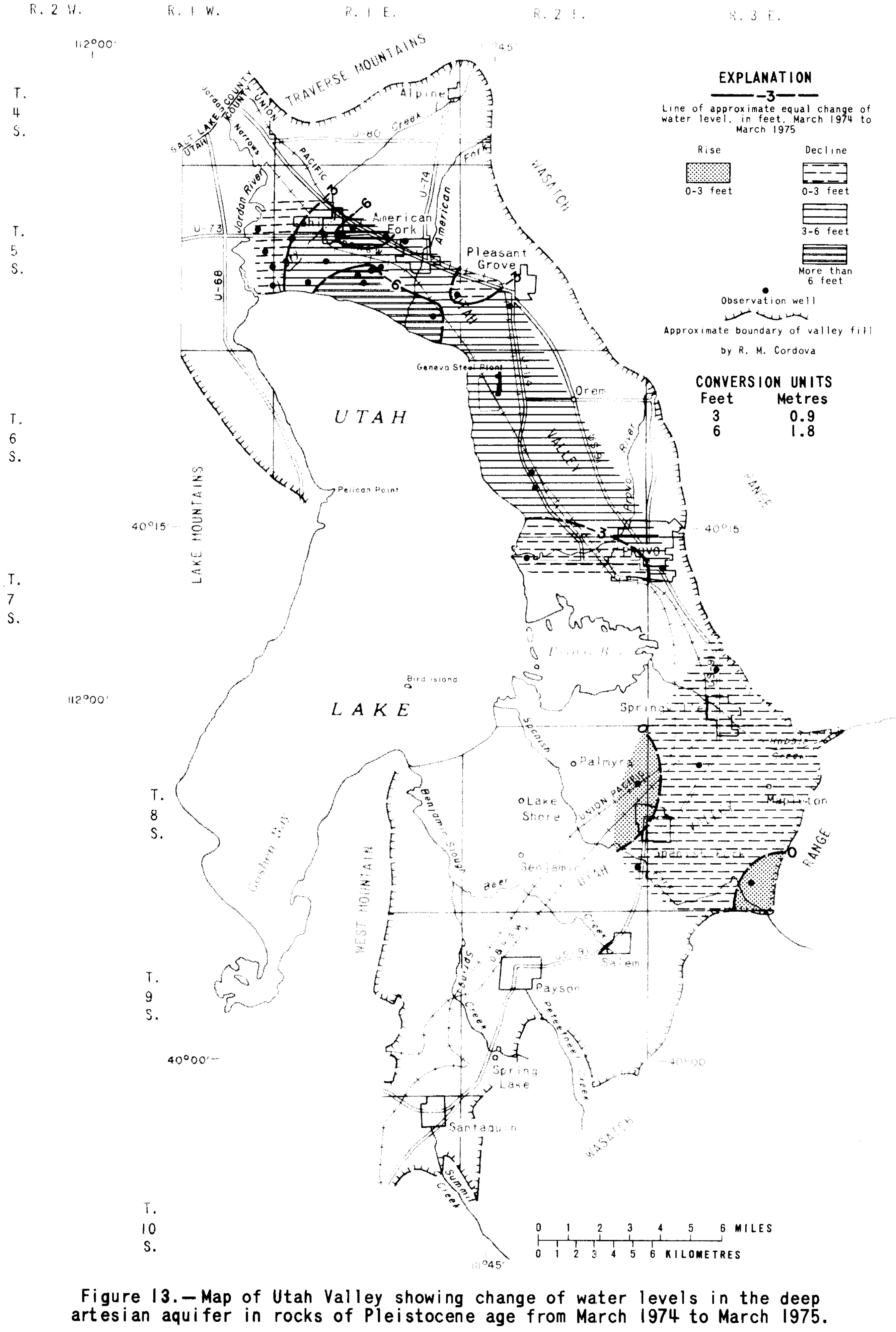


Figure 13.—Map of Utah Valley showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1974 to March 1975.

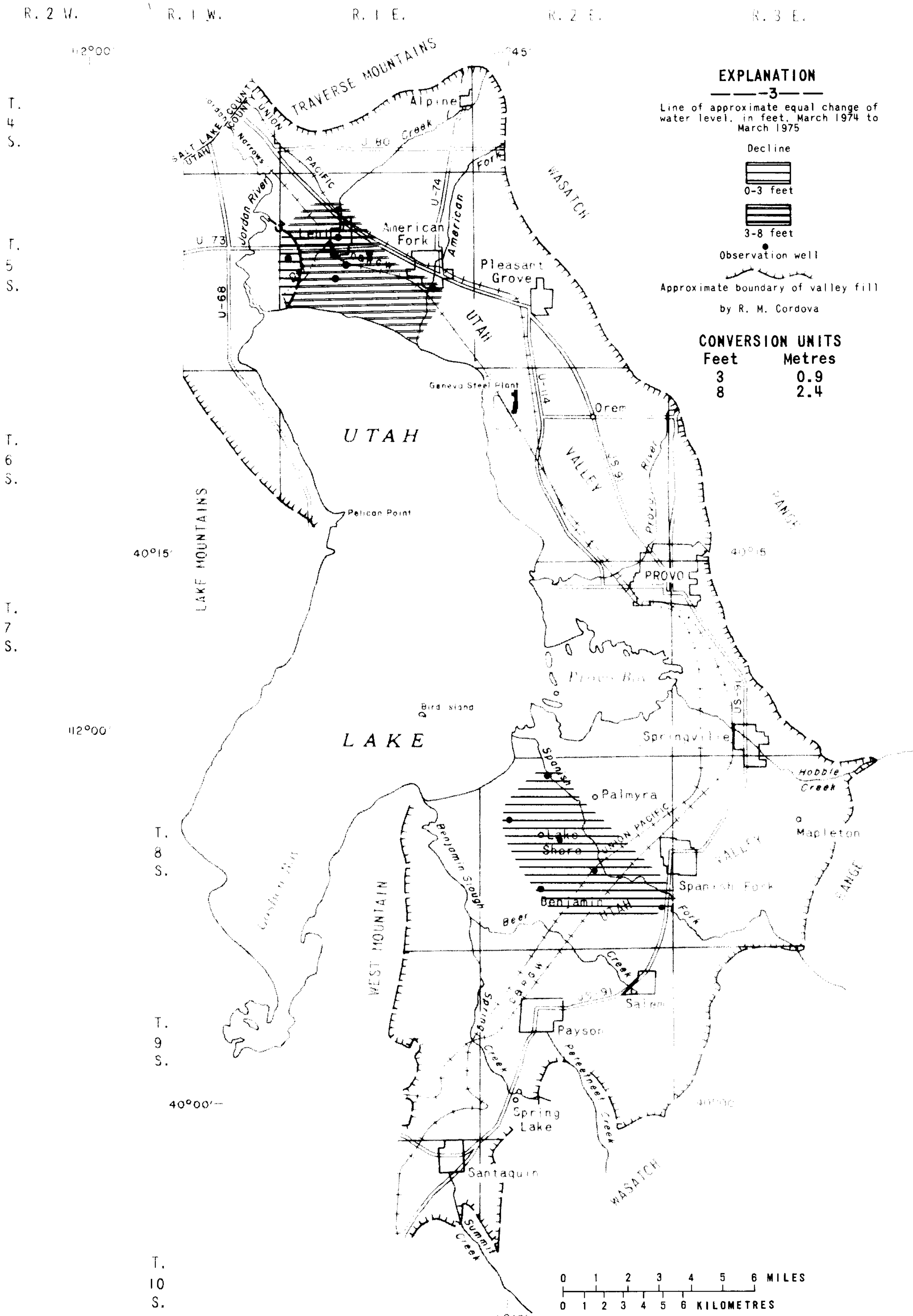


Figure 14.—Map of Utah Valley showing change of water levels in the artesian aquifer in rocks of Tertiary age from March 1974 to March 1975.

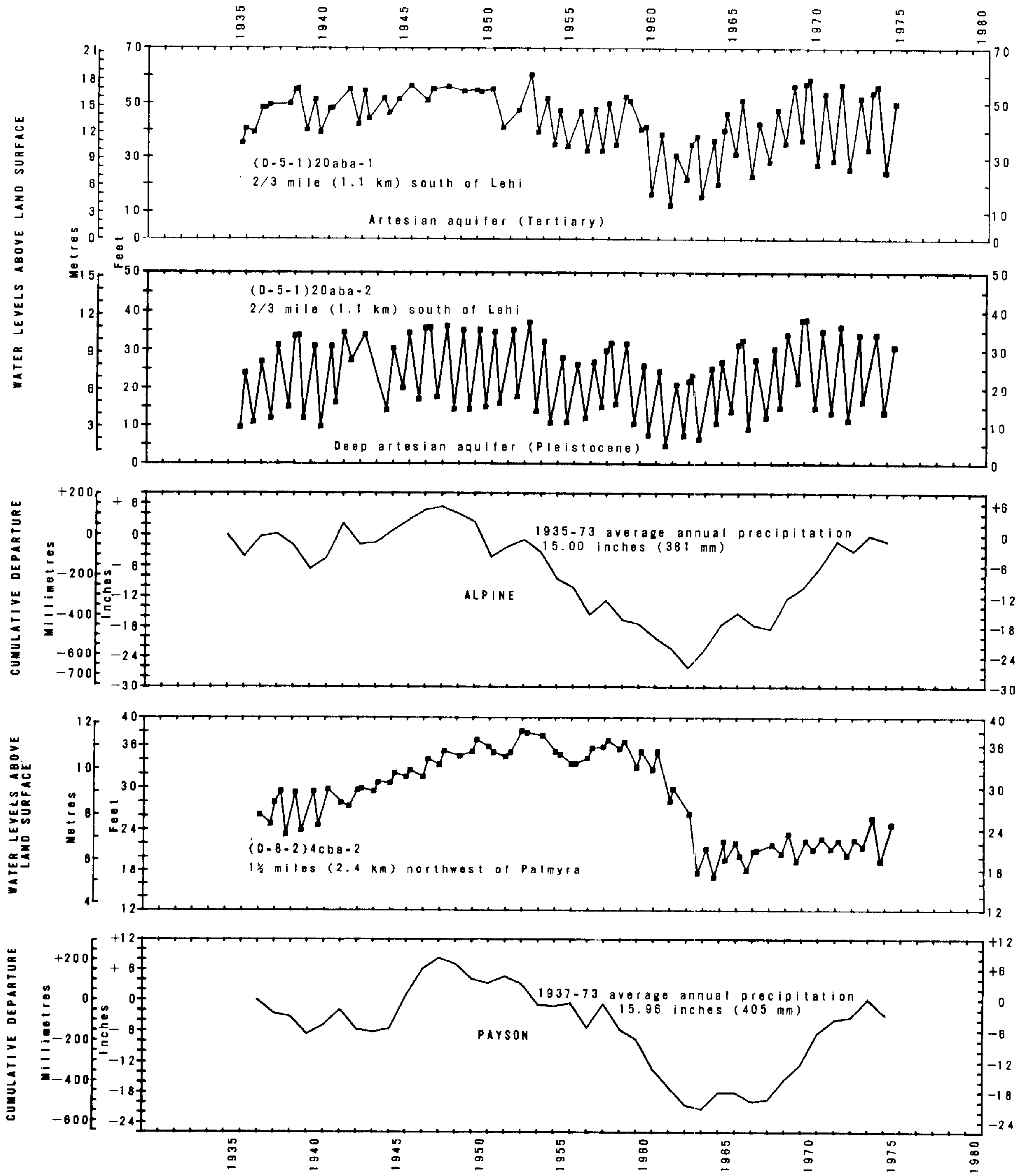
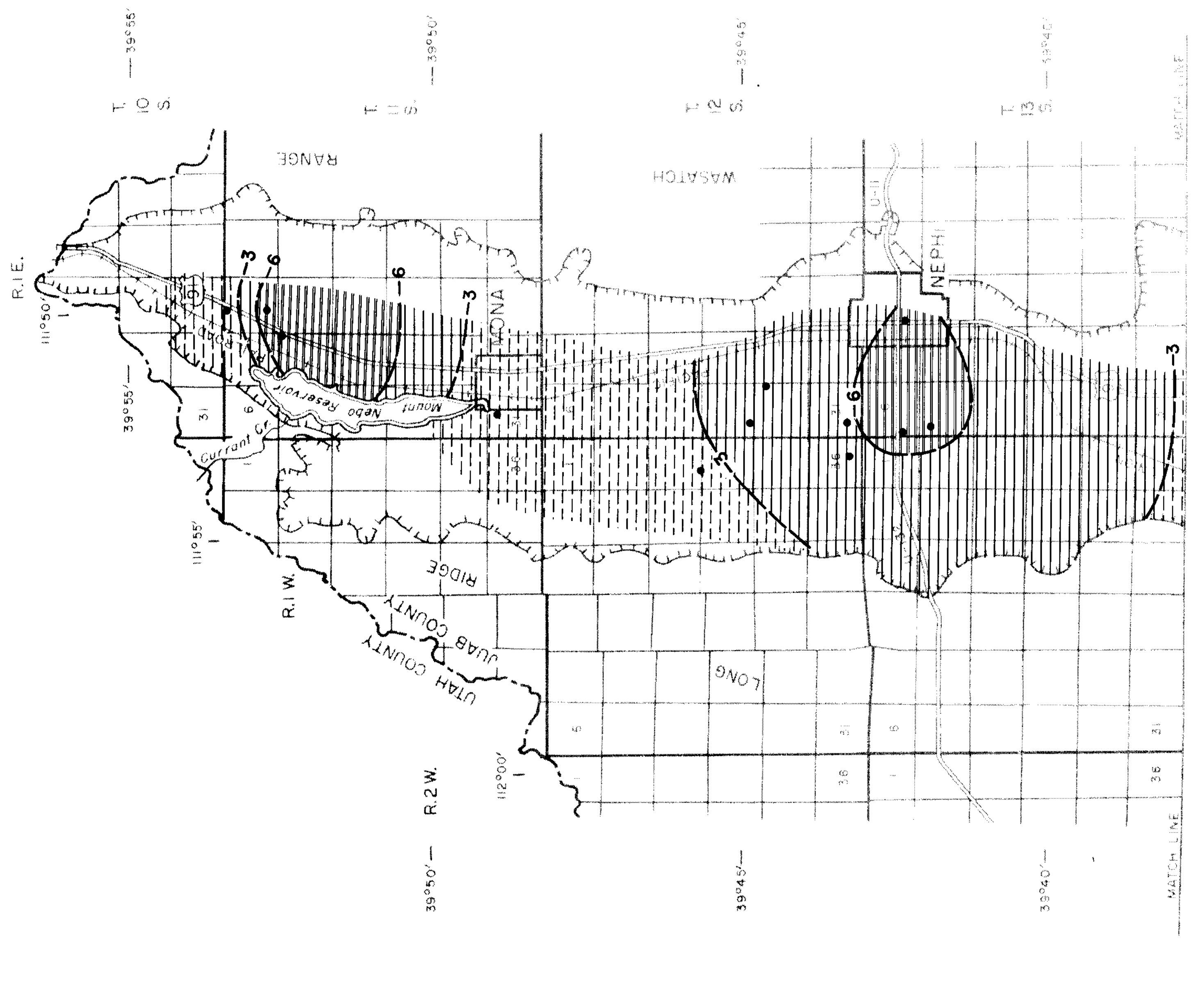


Figure 15.—Relation of water levels in selected wells in Utah Valley to cumulative departure from the average annual precipitation at Alpine and Payson.


R.1 E.
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T. 12 S.
T. 13 S.
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39°45'
39°40'
111°50'
111°55'
112°00'
WASATCH
RANGE
LONG
RIDGE
JUAB COUNTY
UTAH COUNTY
Mount Nebo Reservoir
Currant Cr.
MONA
NEPHI
MATCH LINE
3
6

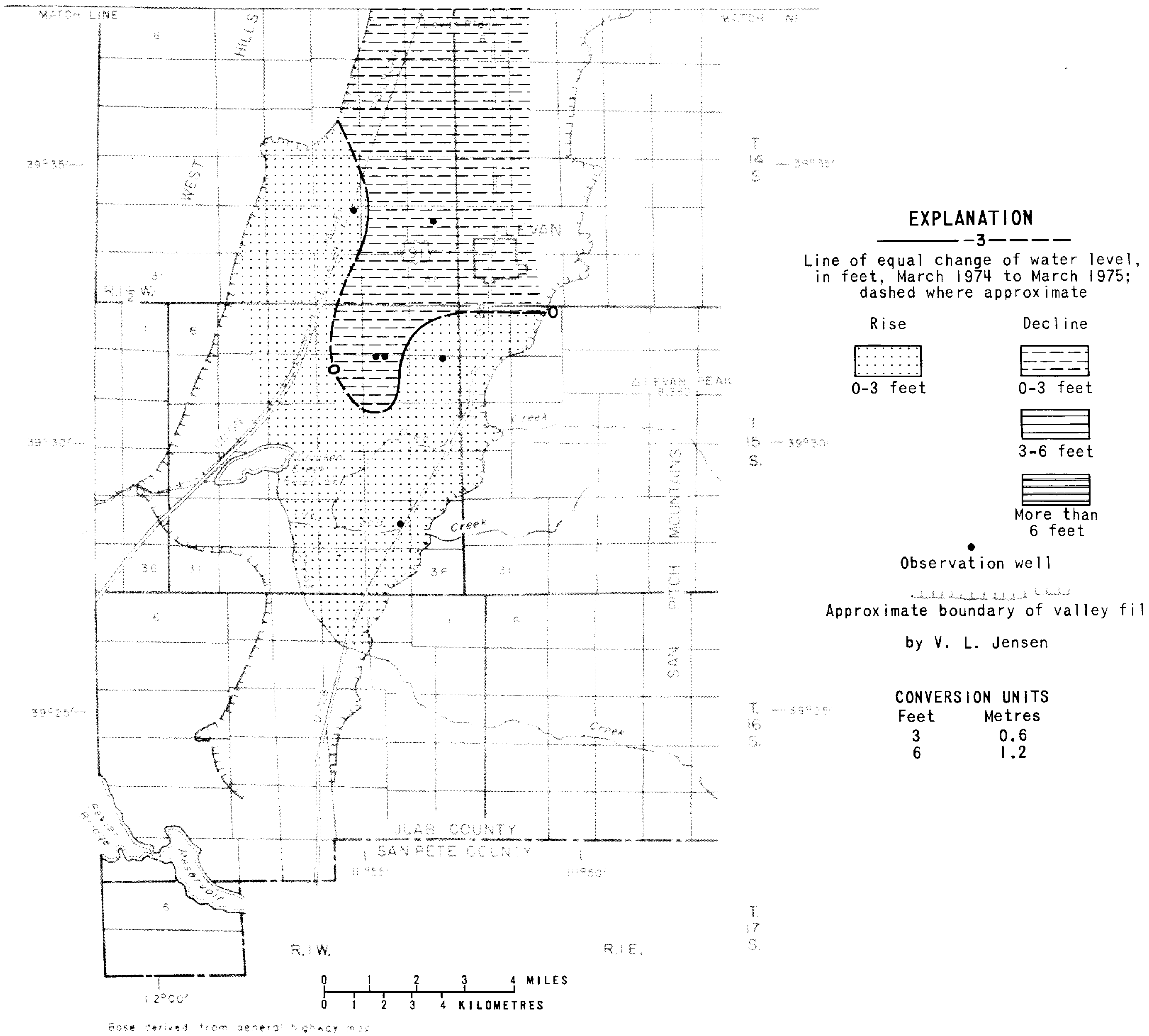


Figure 16.—Map of Juab Valley showing change of water levels from March 1974 to March 1975.

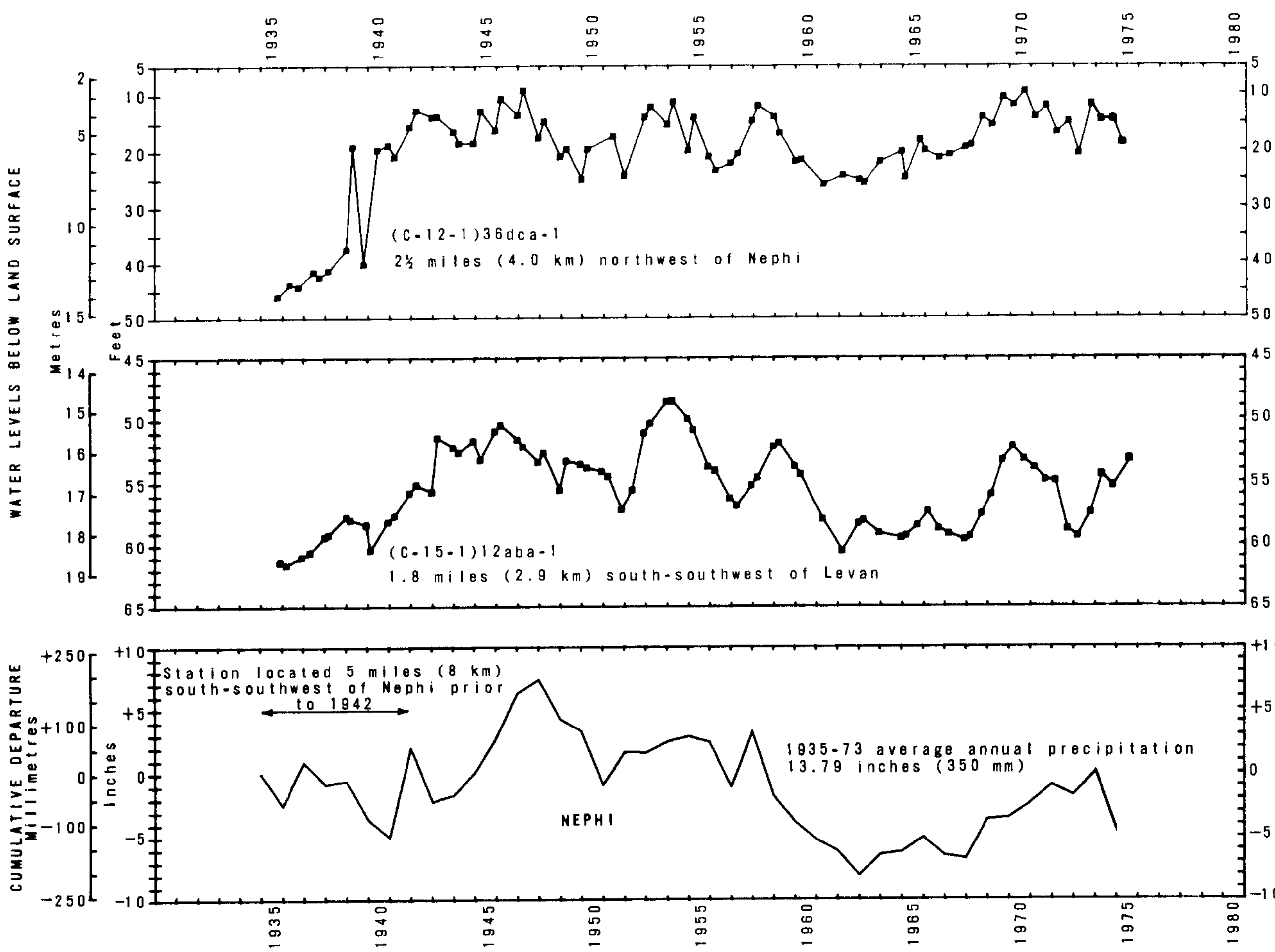


Figure 17.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi.

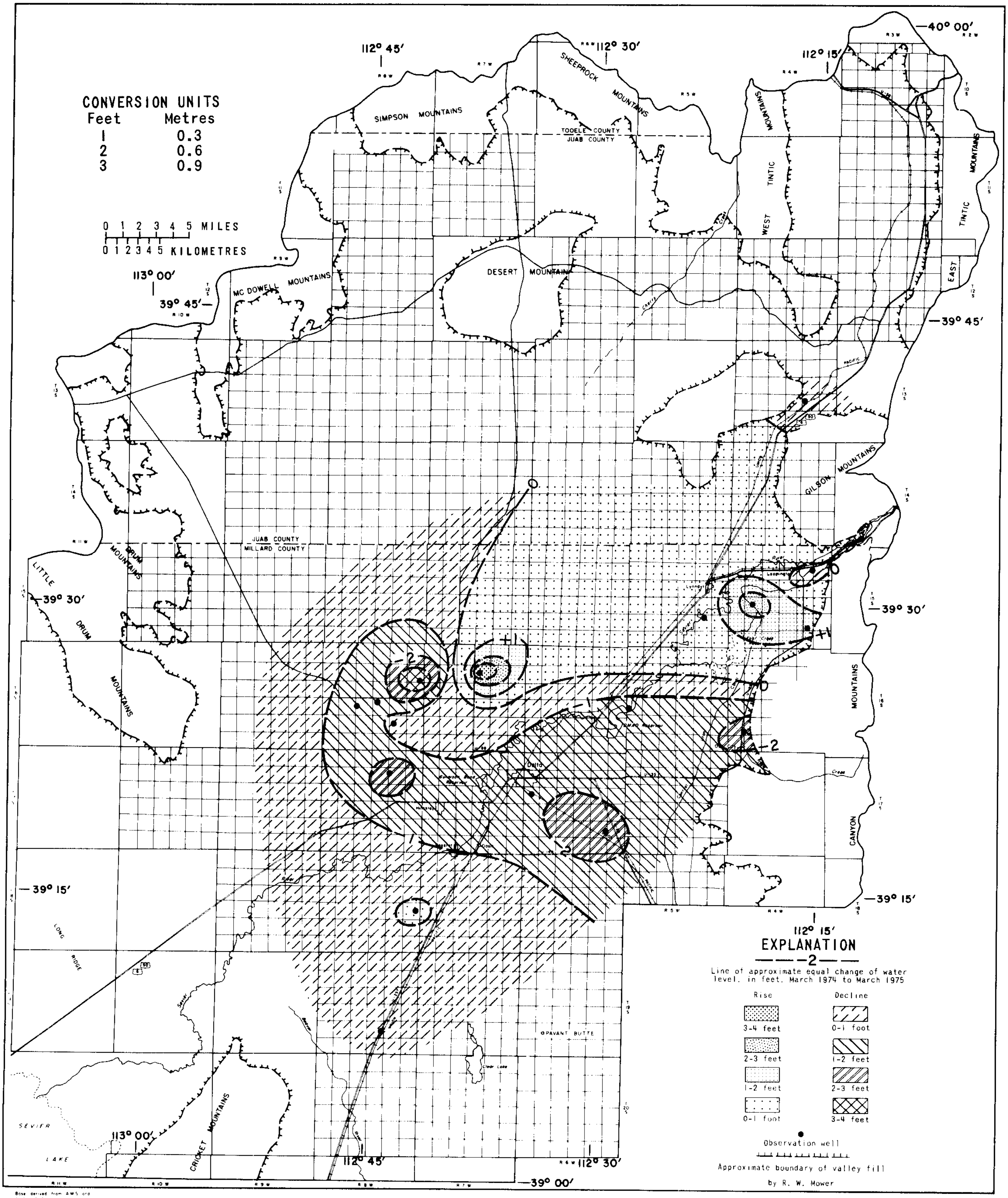


Figure 18.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1974 to March 1975.

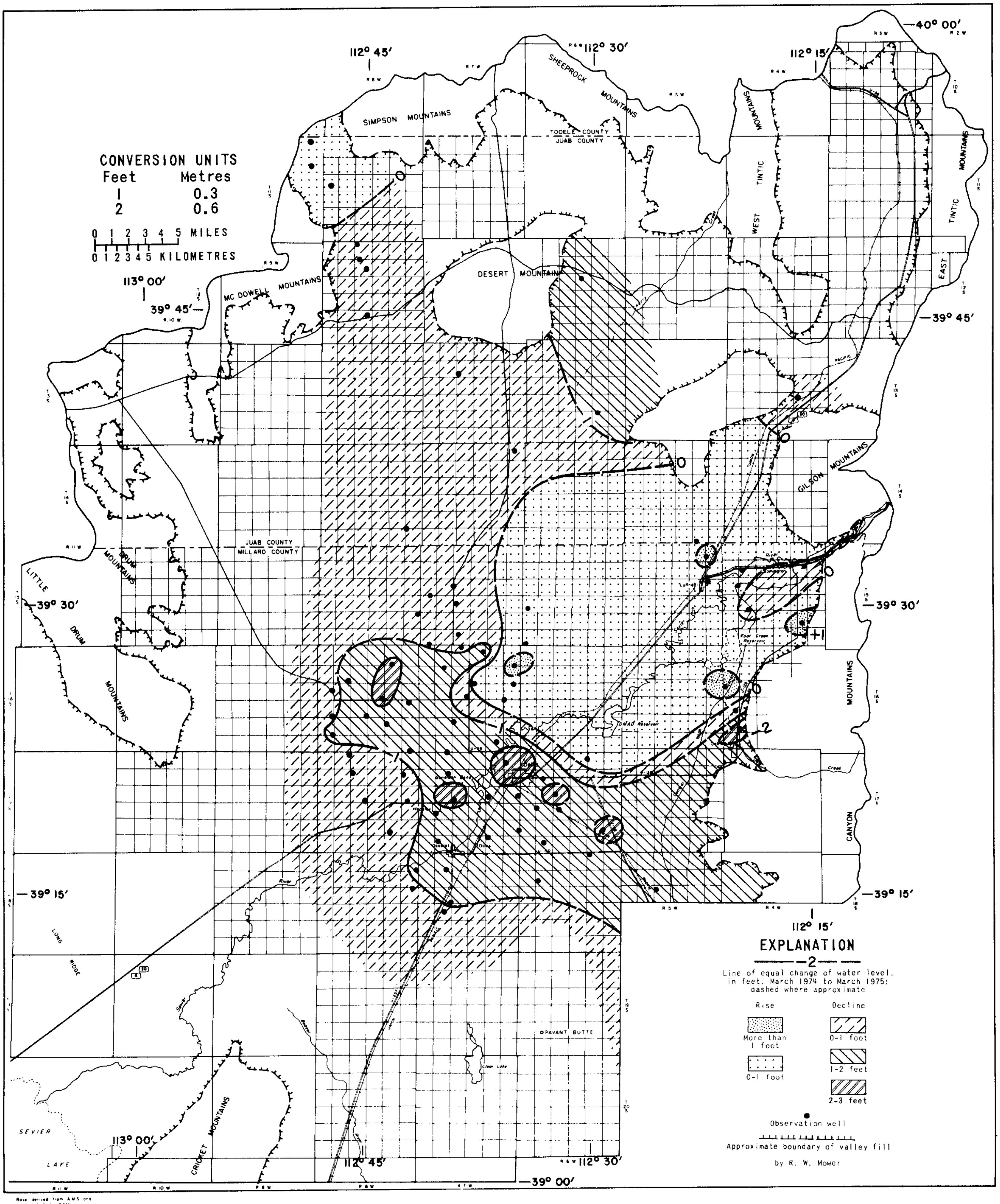


Figure 19.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1974 to March 1975.

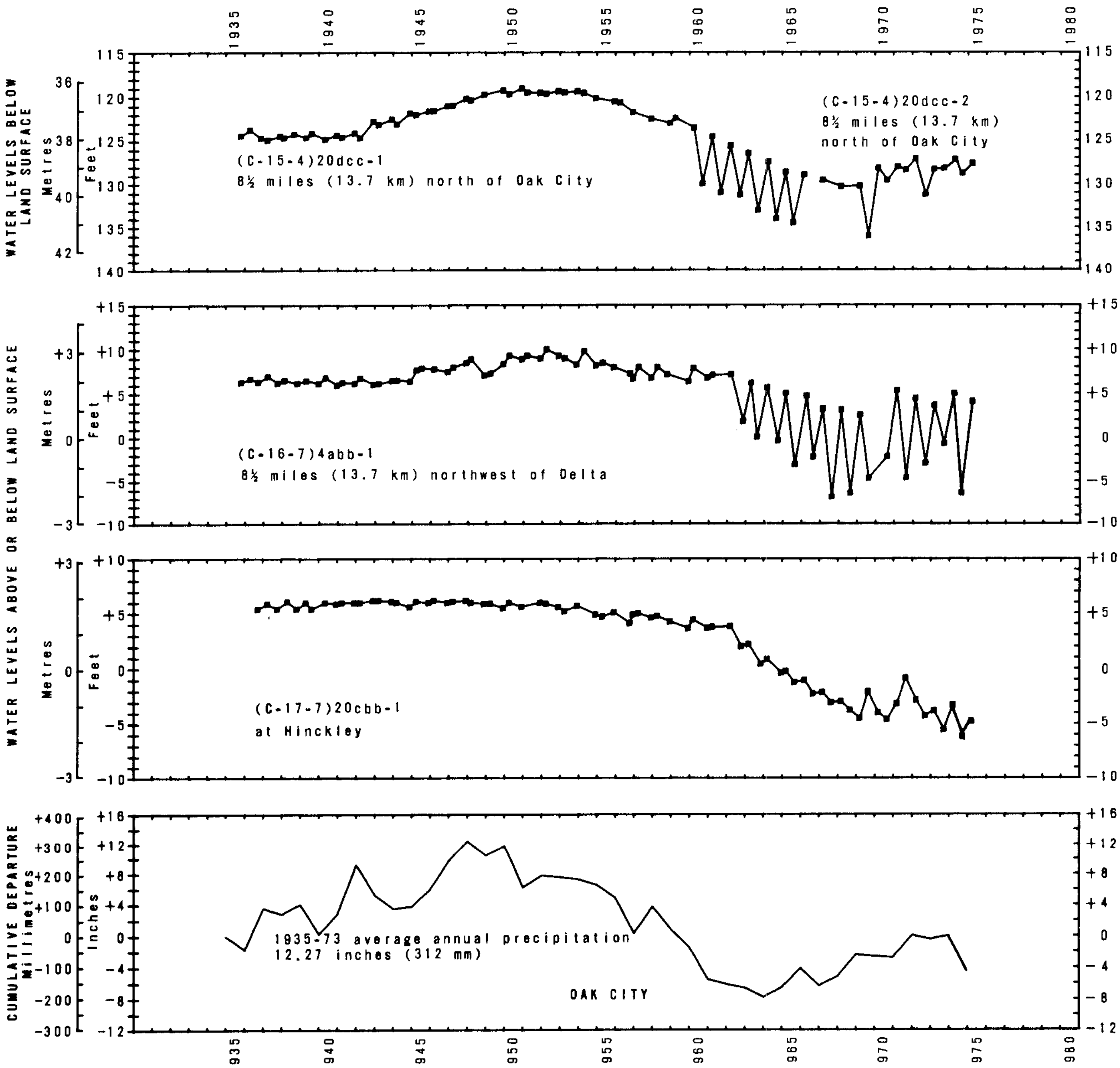


Figure 20.—Relation of water levels in selected wells in the Sevier Desert to cumulative departure from the average annual precipitation at Oak City.

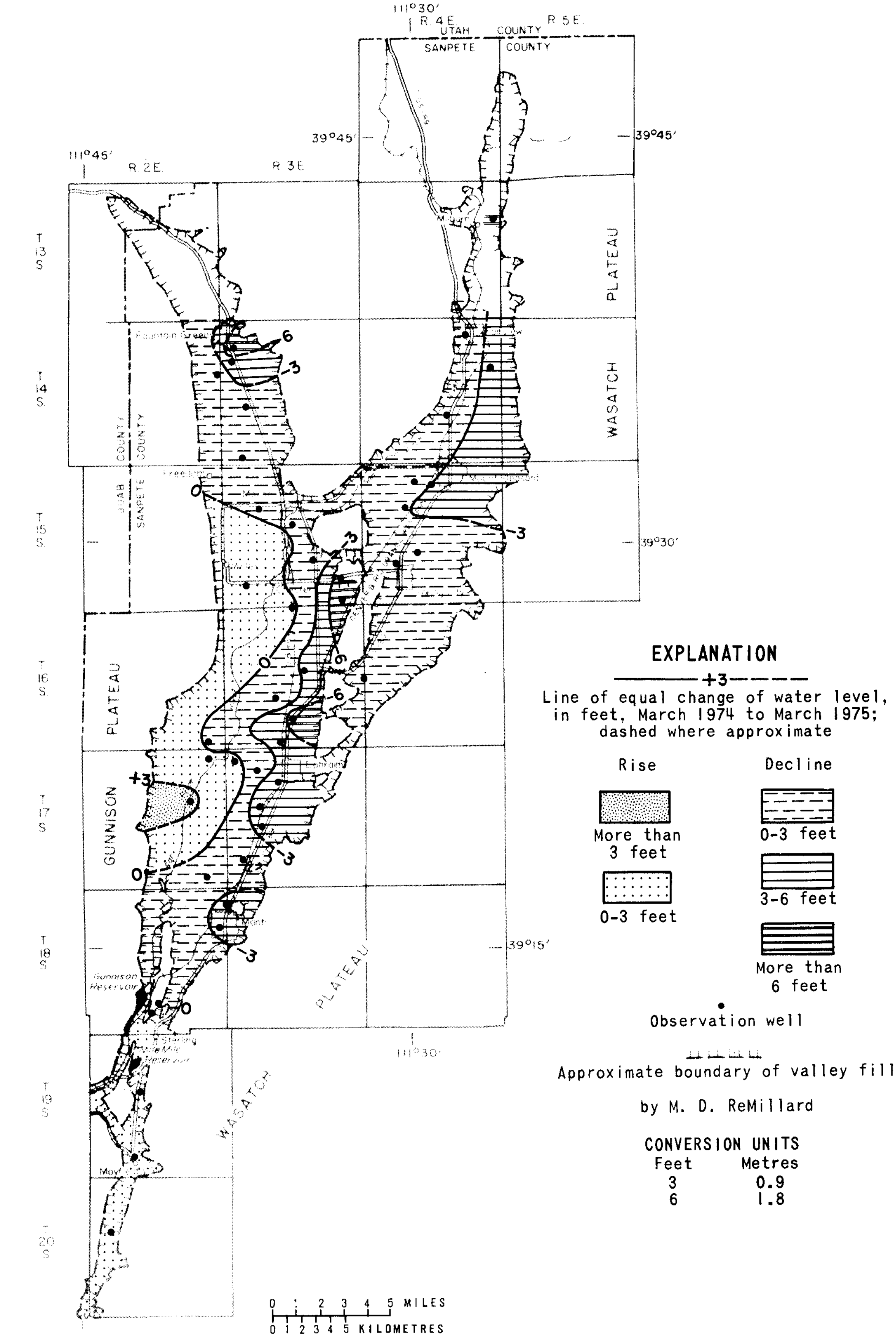


Figure 21.—Map of Sanpete Valley showing change of water levels from March 1974 to March 1975.

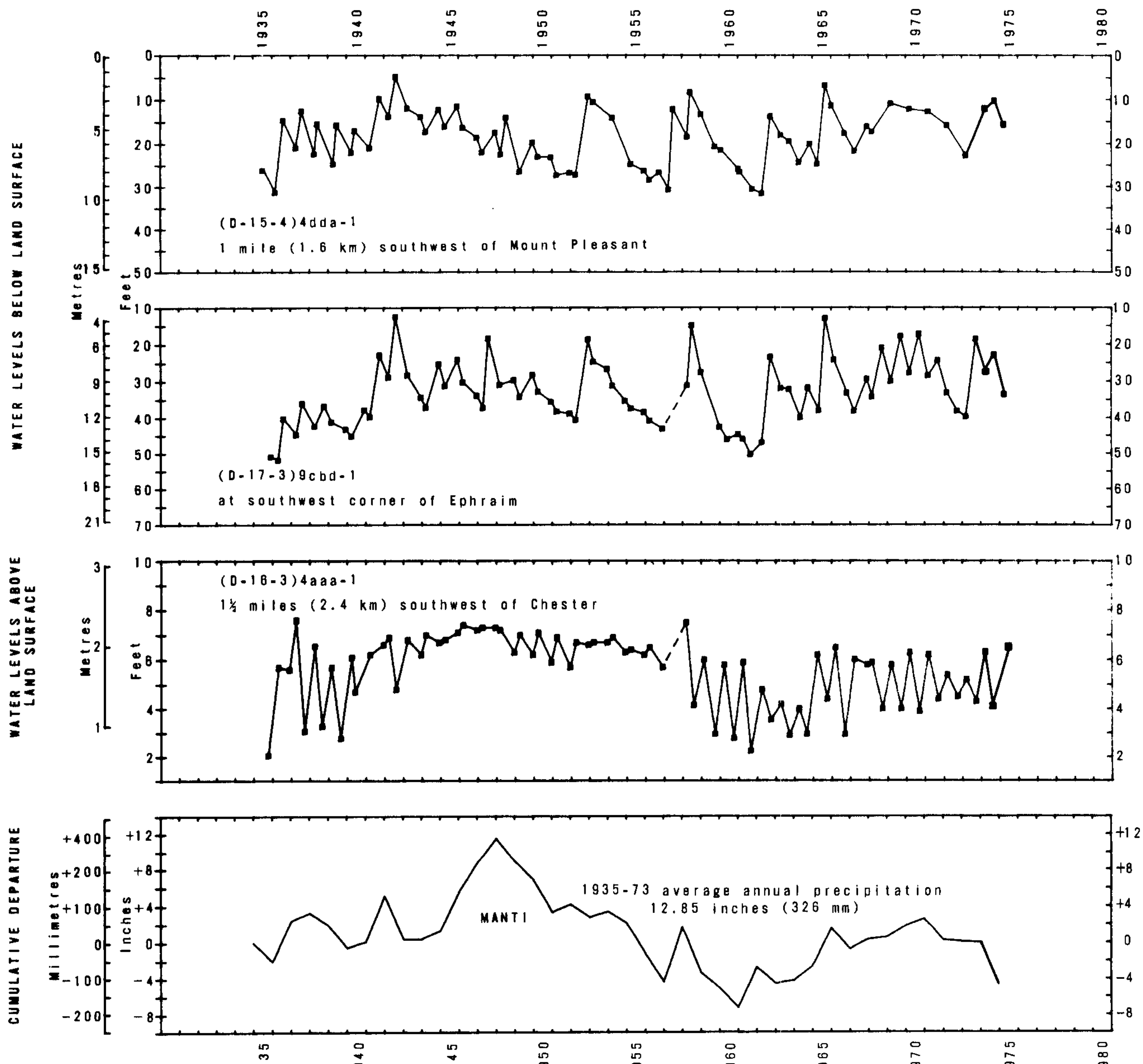
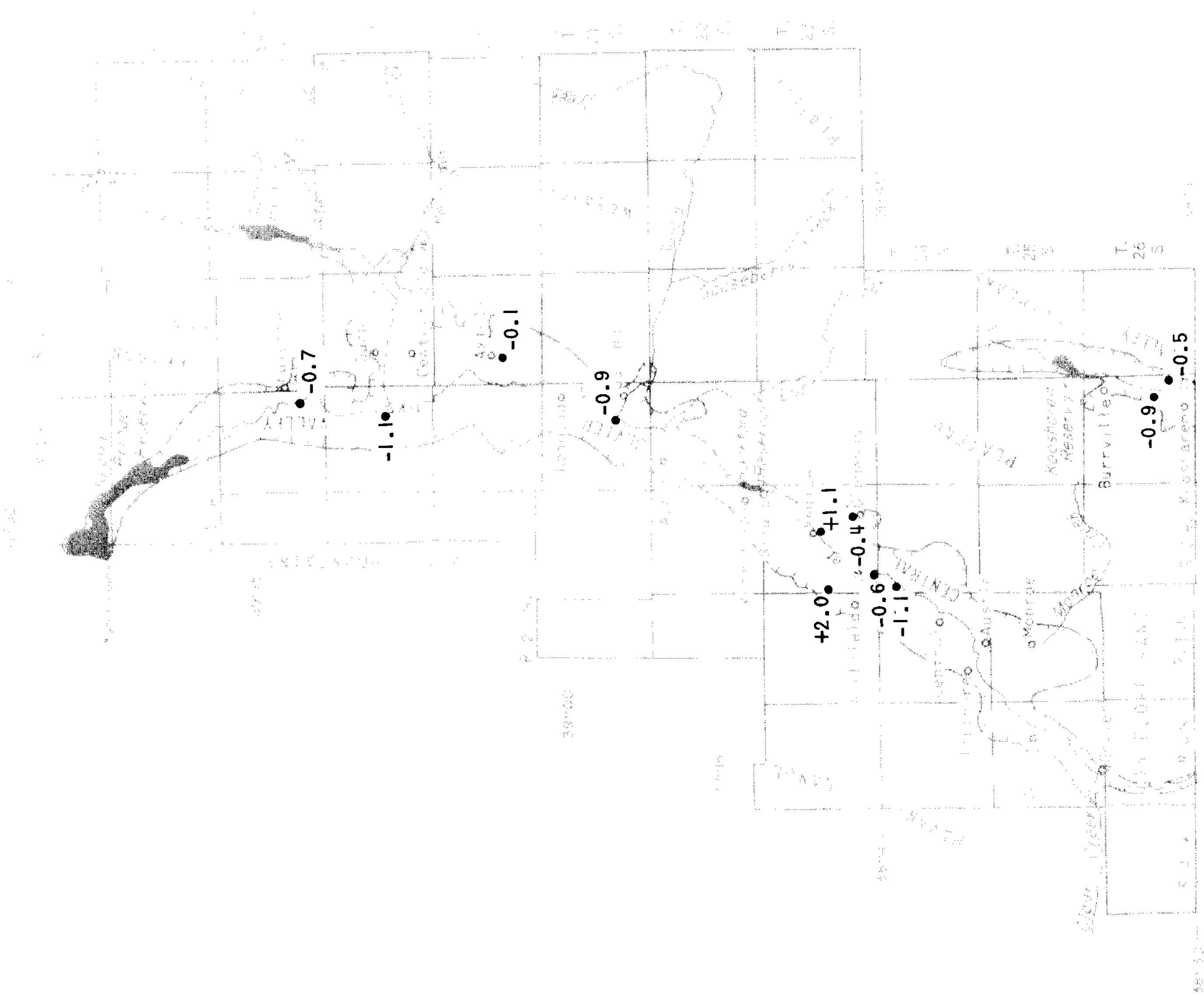
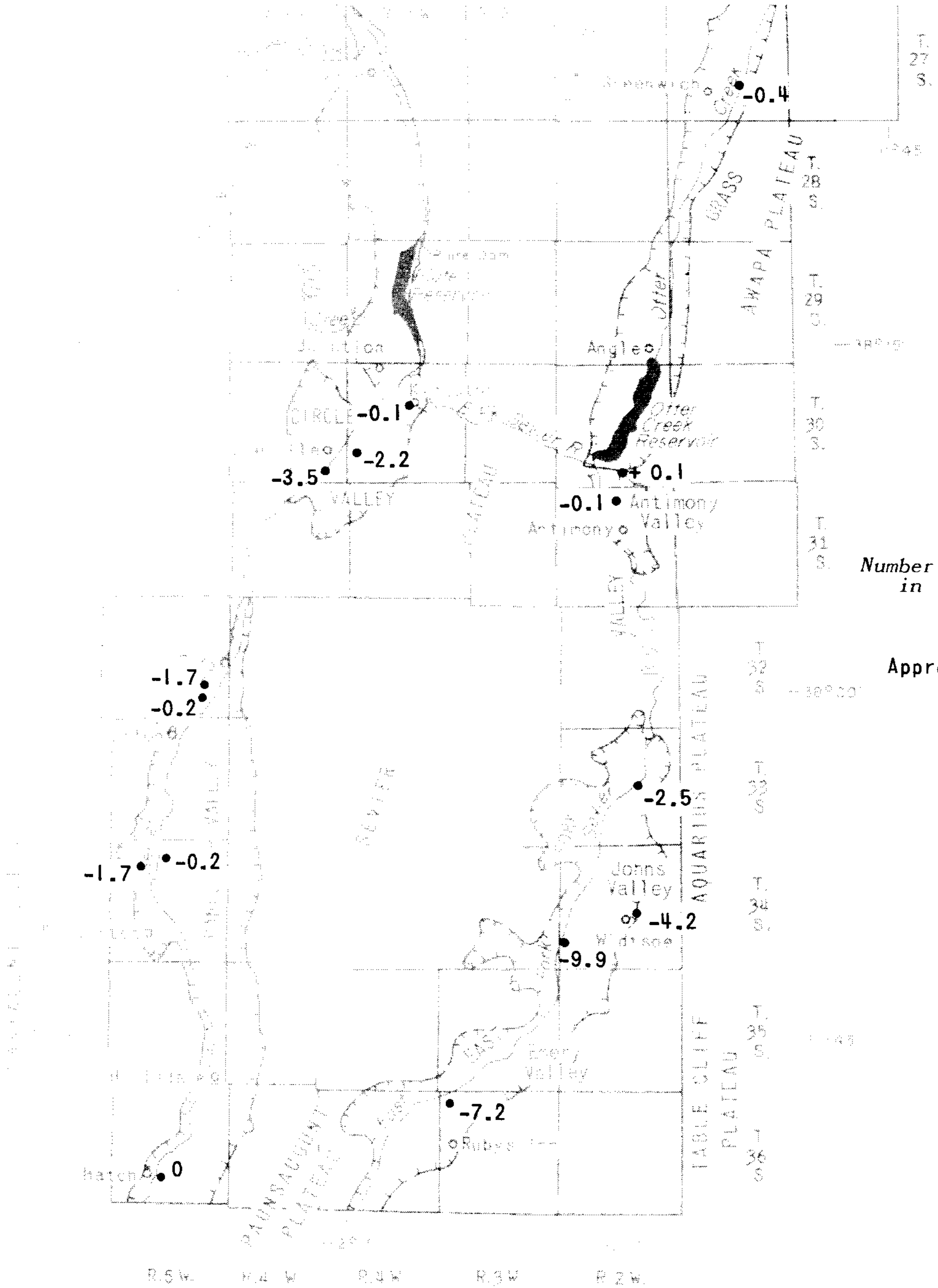


Figure 22.—Relation of water levels in selected wells in Sanpete Valley to cumulative departure from the average annual precipitation at Manti.



-0.7
-1.1
-0.1
-0.9
+1.1
-0.4
-0.6
+2.0
-1.1
-0.9
-0.5



EXPLANATION

-3.5
•
Observation well
Number indicates change of water level, in feet, March 1974 to March 1975

Approximate boundary of valley fill

by G. W. Sandberg

CONVERSION UNITS

Feet	Metres
1	0.3
2	0.6
3	0.9
4	1.2
5	1.5
6	1.8
7	2.1
8	2.4
9	2.7
10	3.0

0 5 10 MILES
0 5 10 KILOMETRES

Figure 23.— Map of the upper and central Sevier Valleys showing change of water levels from March 1974 to March 1975.

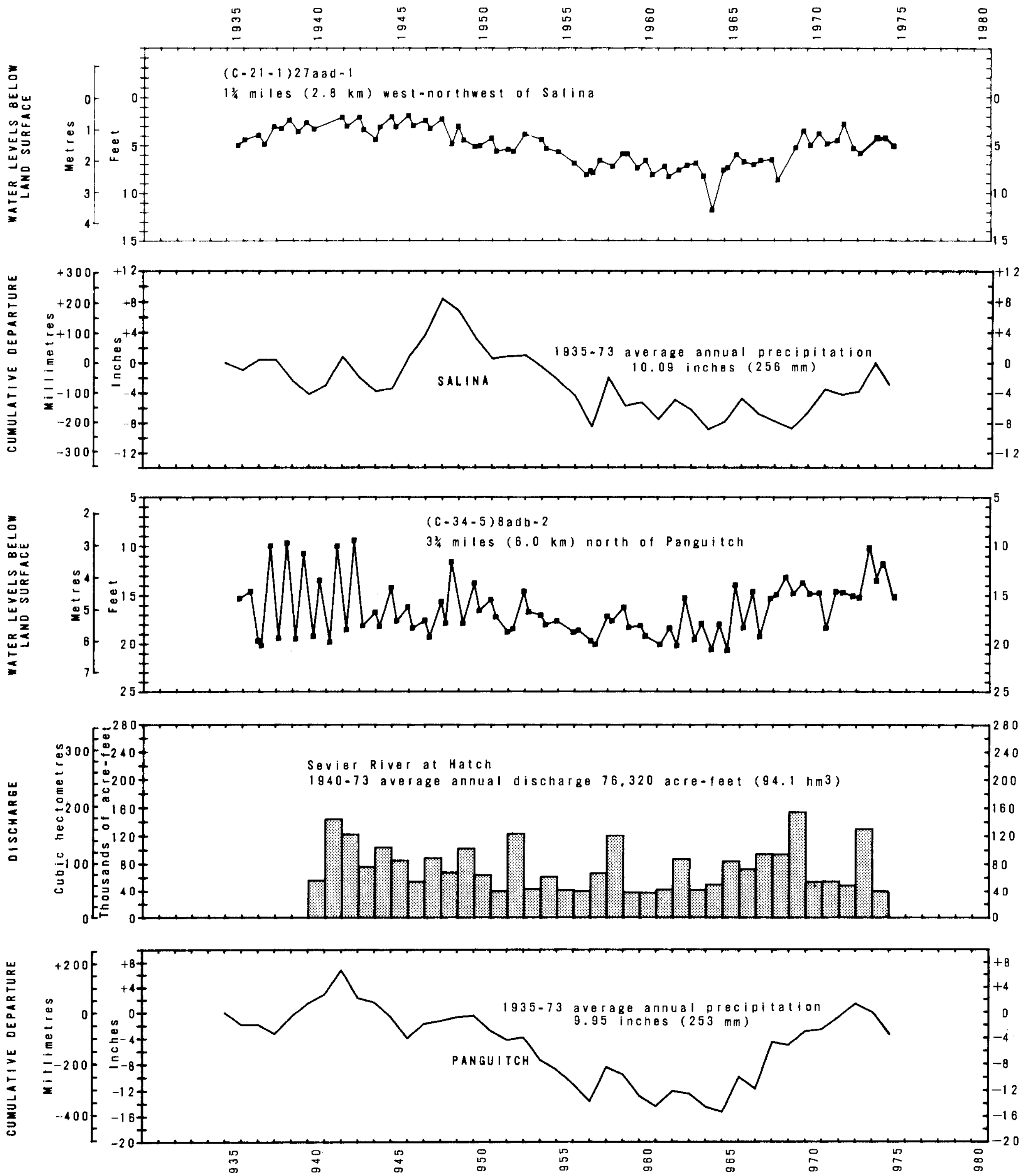


Figure 24.— Relation of water levels in selected wells in the upper and central Sevier Valleys to discharge of the Sevier River at Hatch and to cumulative departure from the average annual precipitation at Salina and Panguitch.

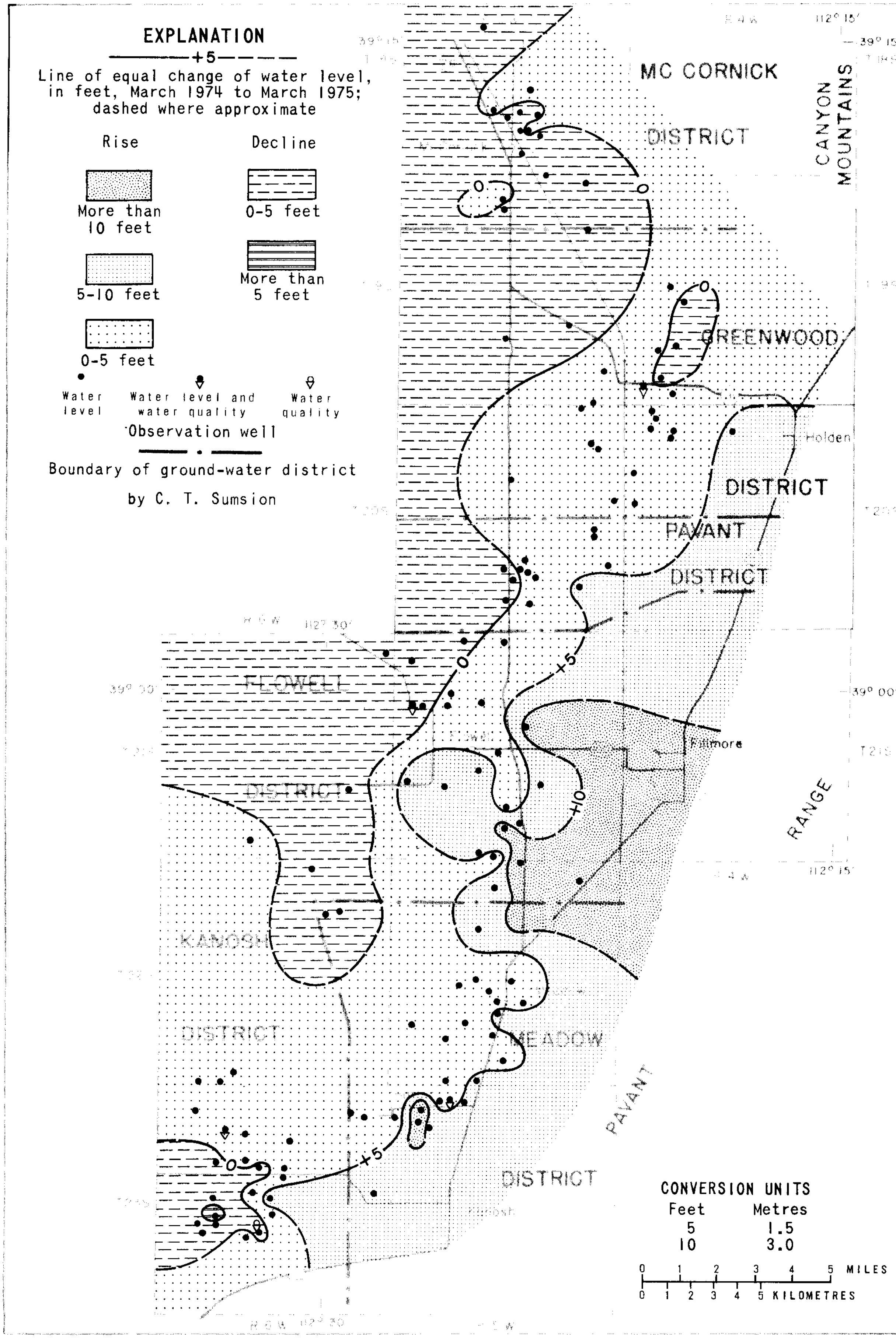


Figure 25.—Map of Pavant Valley showing change of water levels from March 1974 to March 1975.

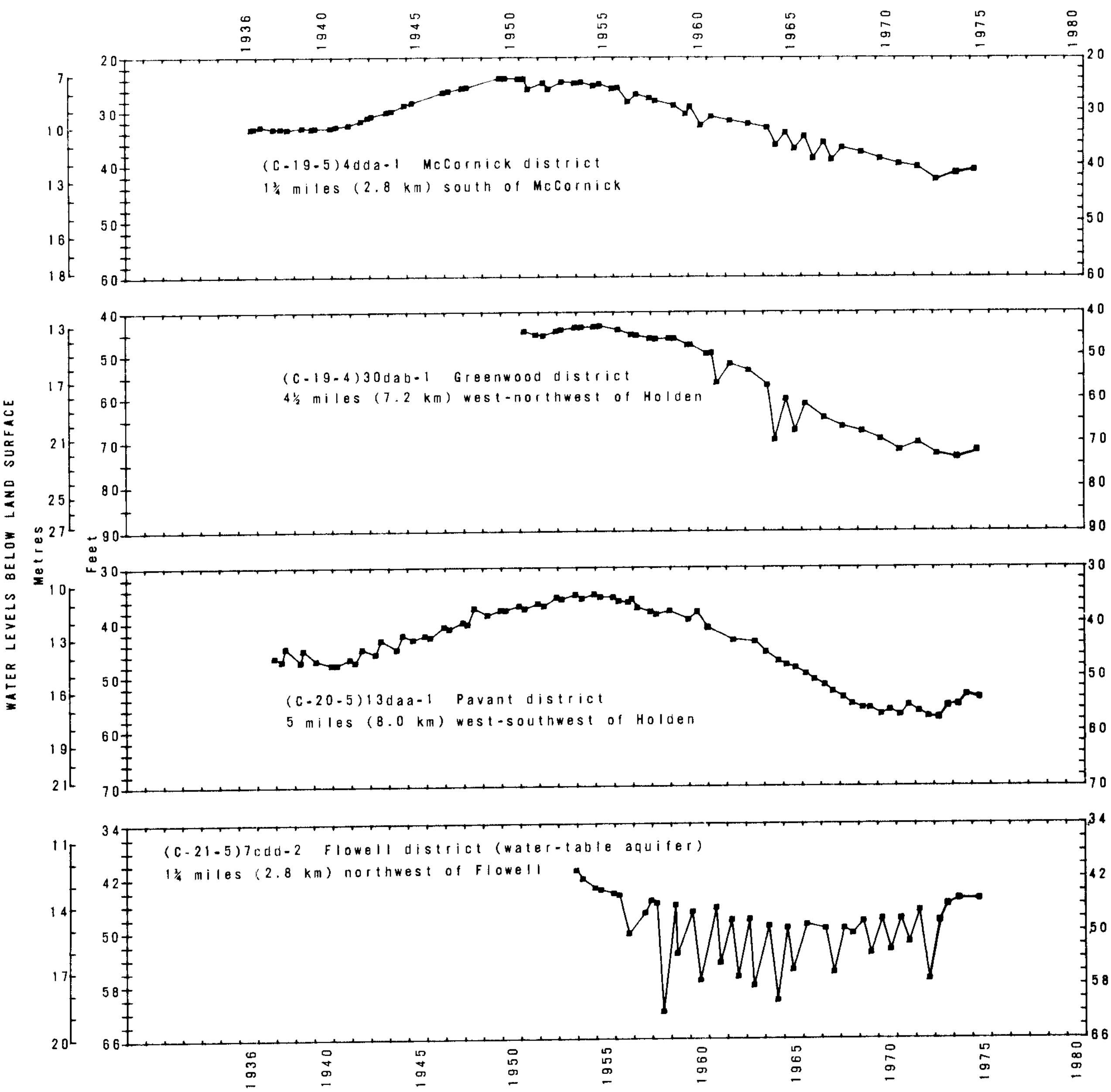


Figure 26.— Relation of water levels in selected wells in Pavant Valley to cumulative departure from the average annual precipitation at Fillmore and to total withdrawals from wells.

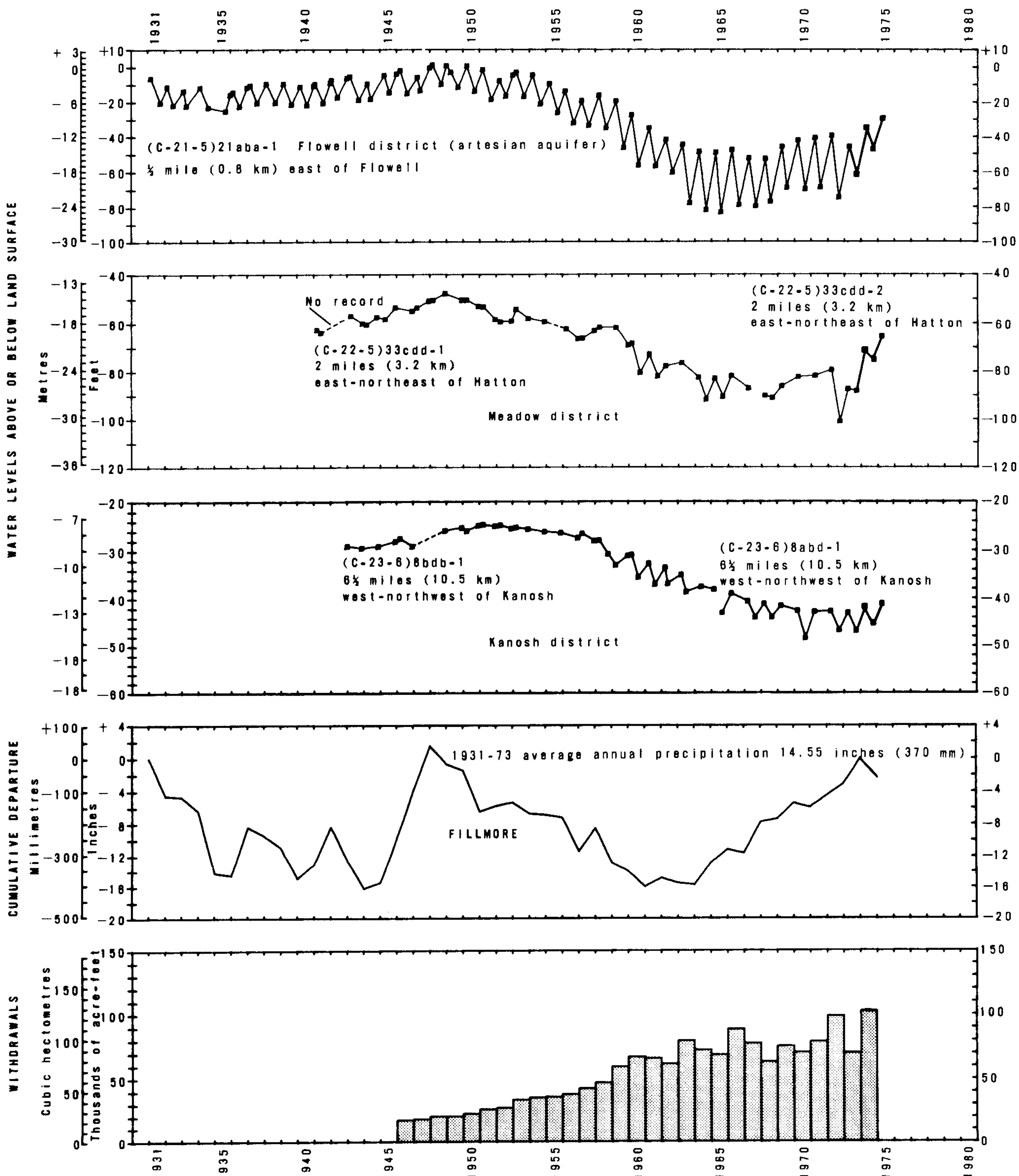


Figure 26.—Continued.

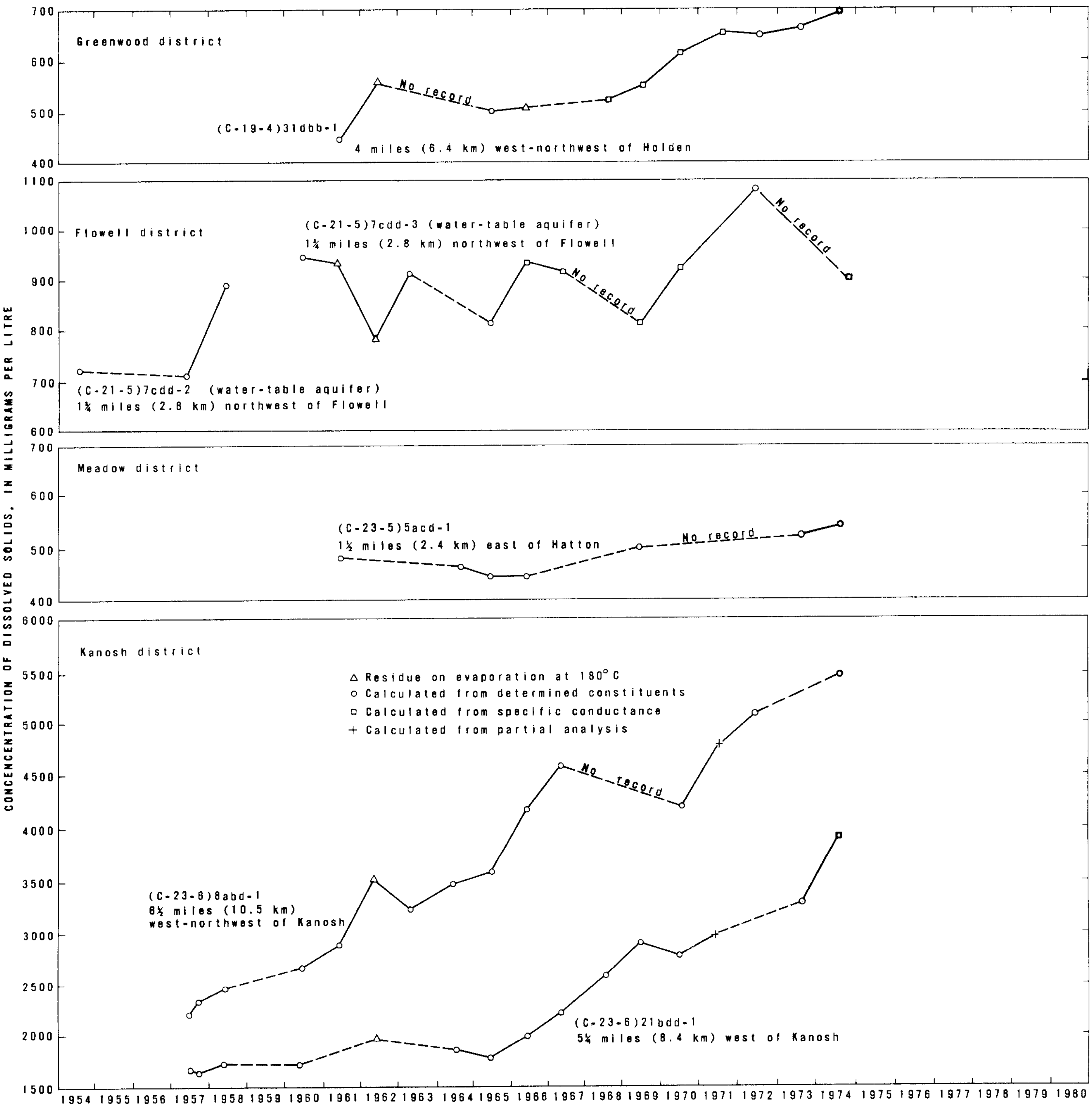


Figure 27.—Concentration of dissolved solids in water from selected wells in Pavant Valley.

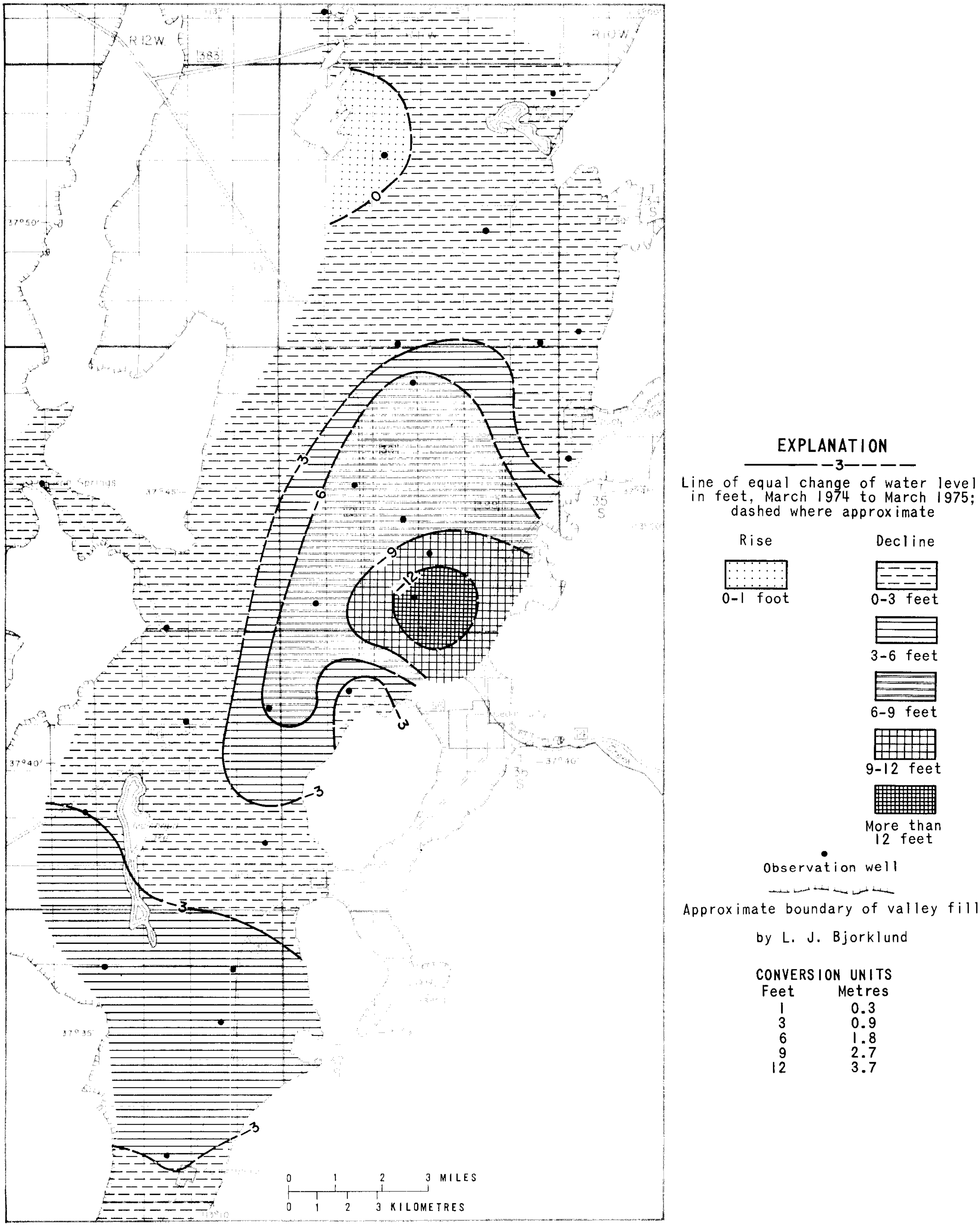


Figure 28.—Map of Cedar City Valley showing change of water levels from March 1974 to March 1975.

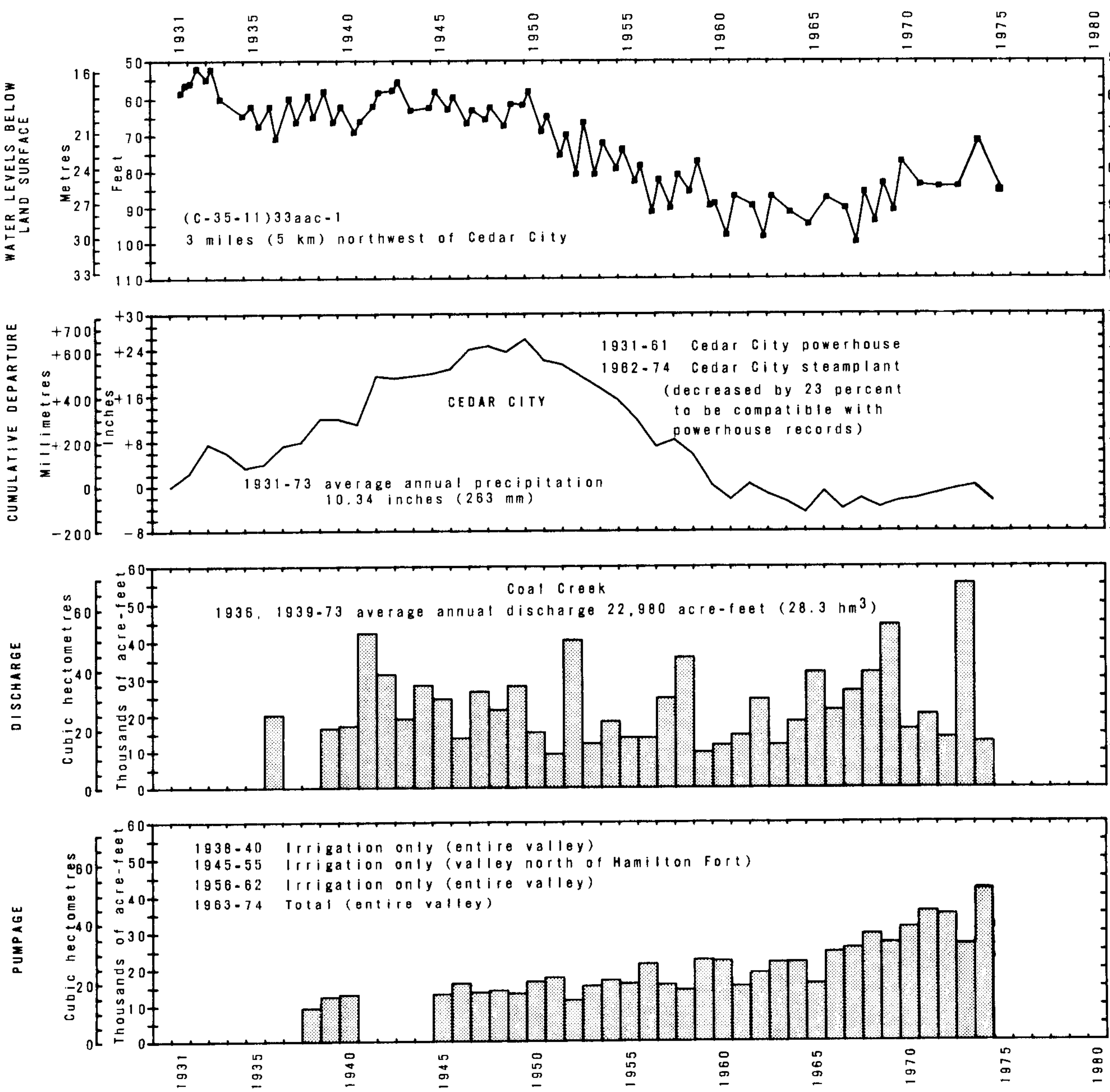


Figure 29.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City powerhouse, to discharge of Coal Creek near Cedar City, and to pumpage from wells.

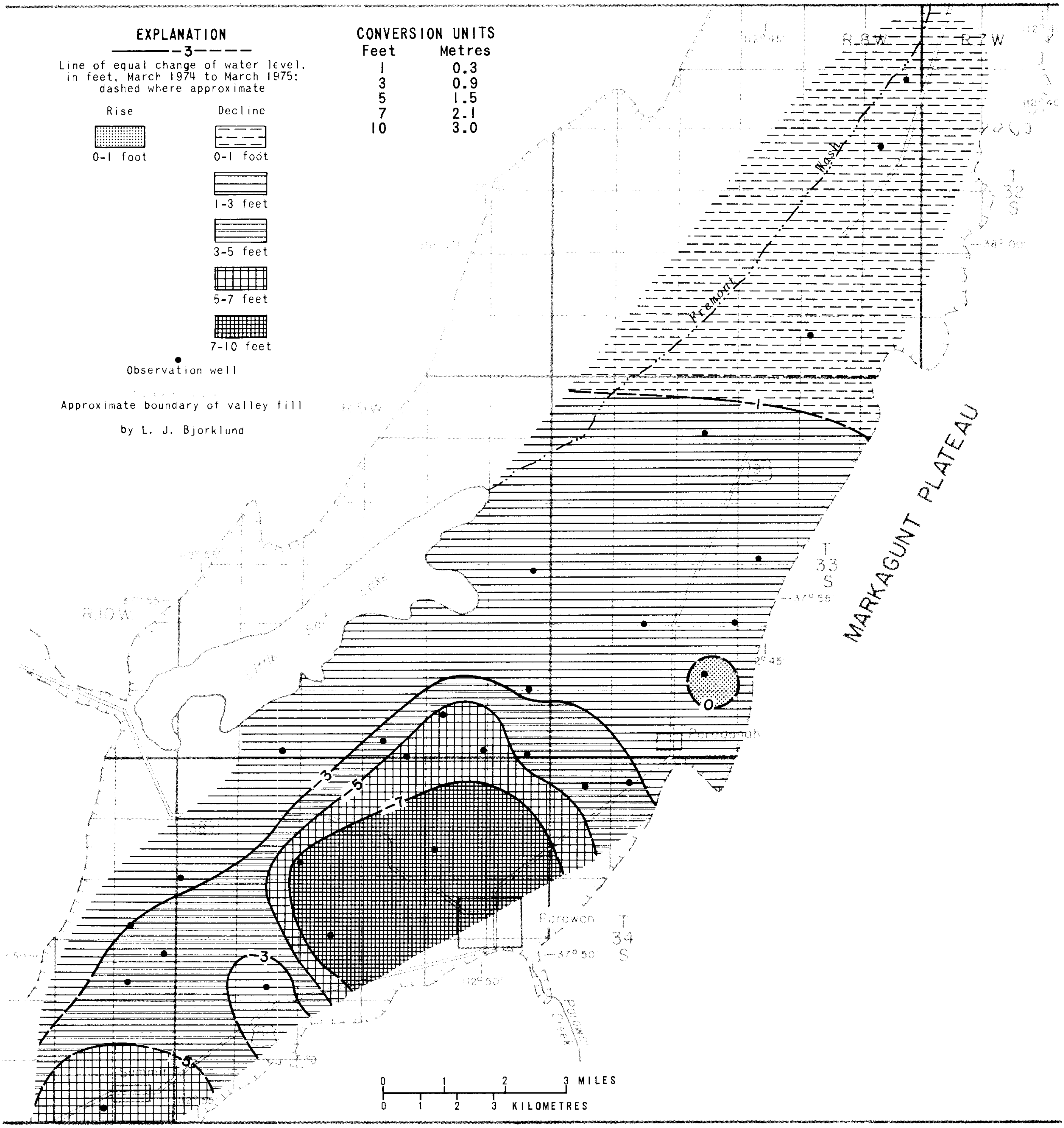


Figure 30.—Map of Parowan Valley showing change of water levels from March 1974 to March 1975.

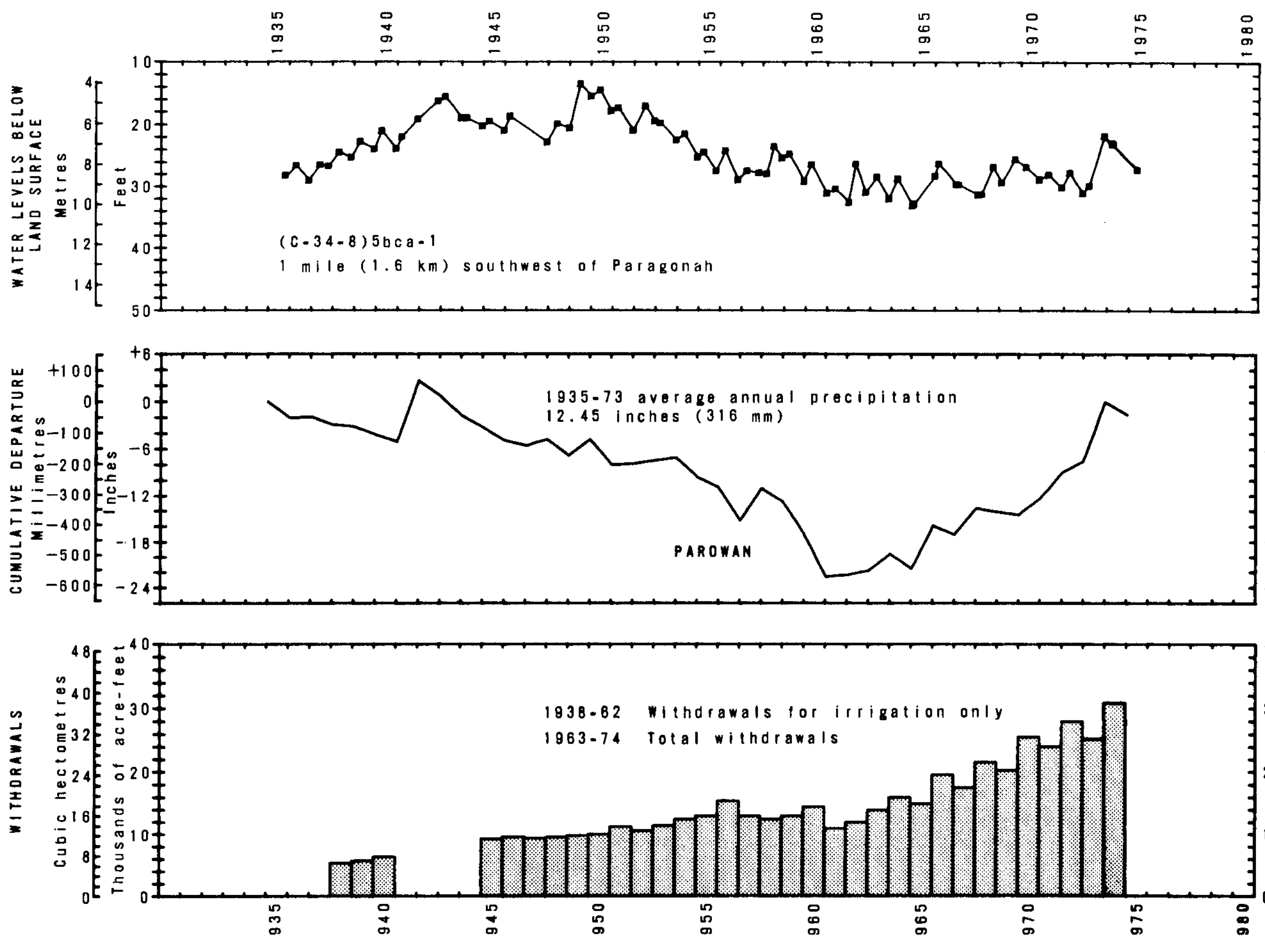


Figure 31.— Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan and to withdrawals from wells.

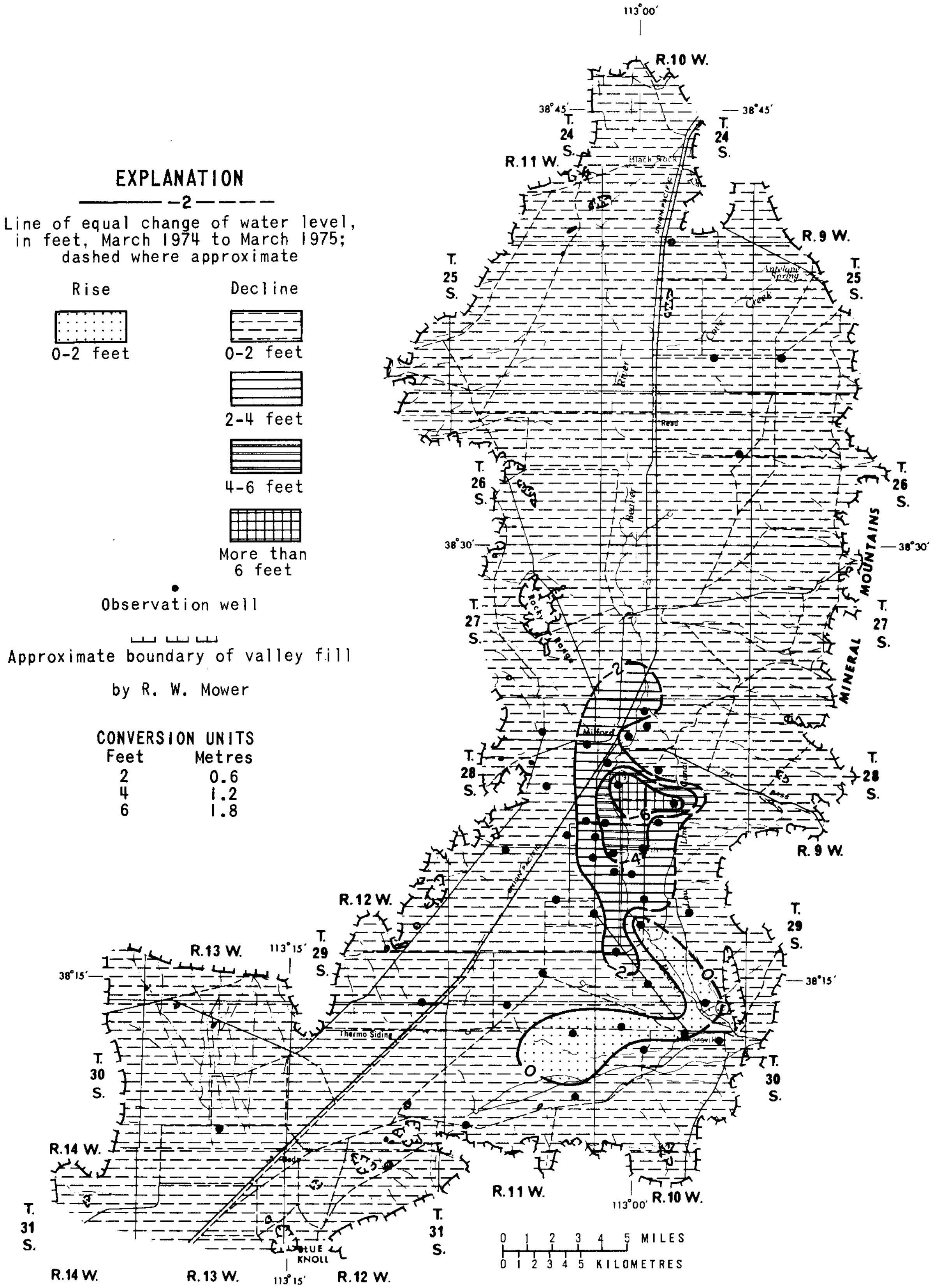


Figure 32.—Map of the Milford area, Escalante Valley, showing change of water levels from March 1974 to March 1975.

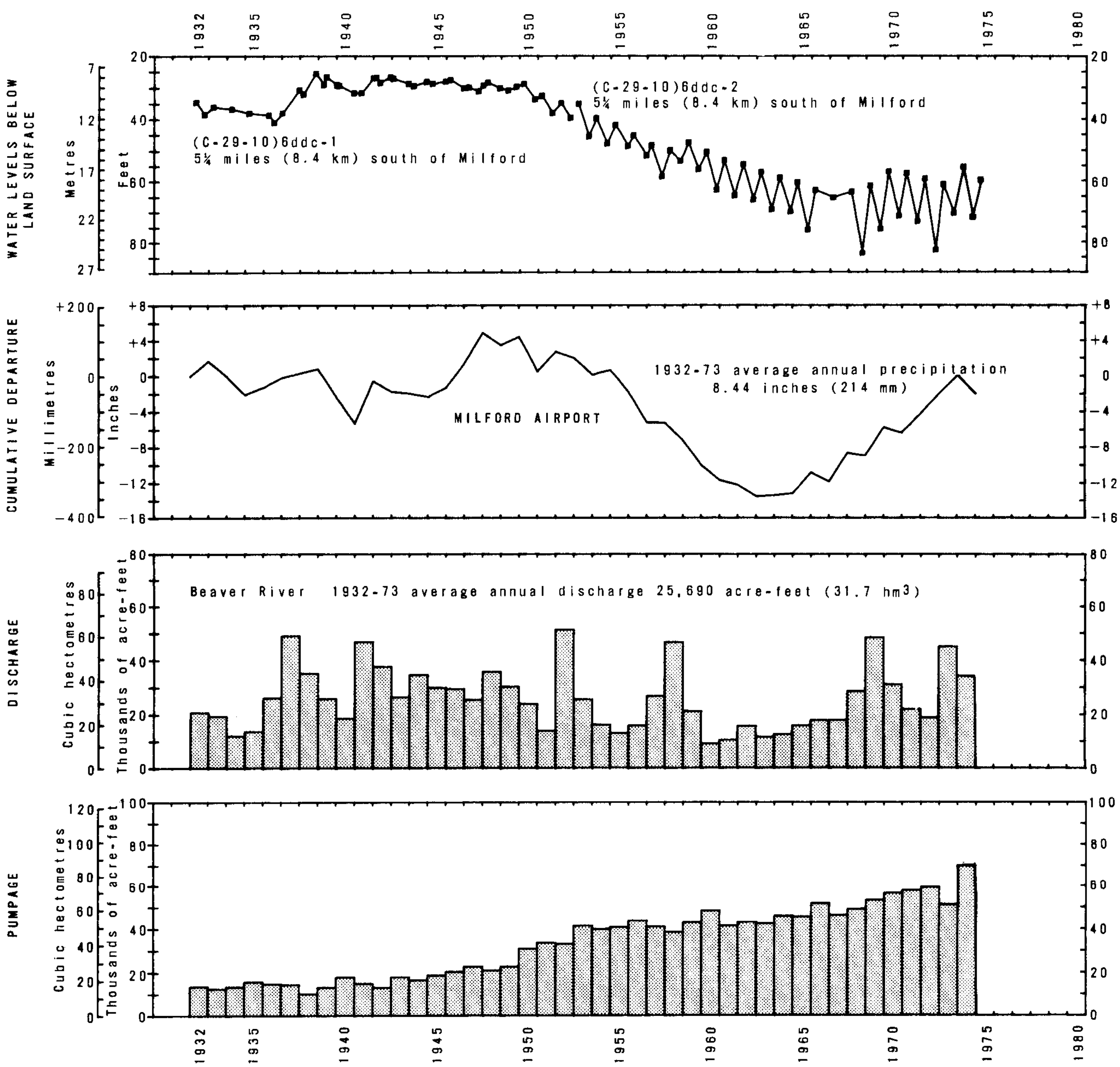


Figure 33.— Relation of water levels in selected wells in the Milford area, Escalante Valley, to cumulative departure from the average annual precipitation at Milford airport, to discharge of the Beaver River at Rockyford Dam near Minersville, and to pumpage for irrigation.

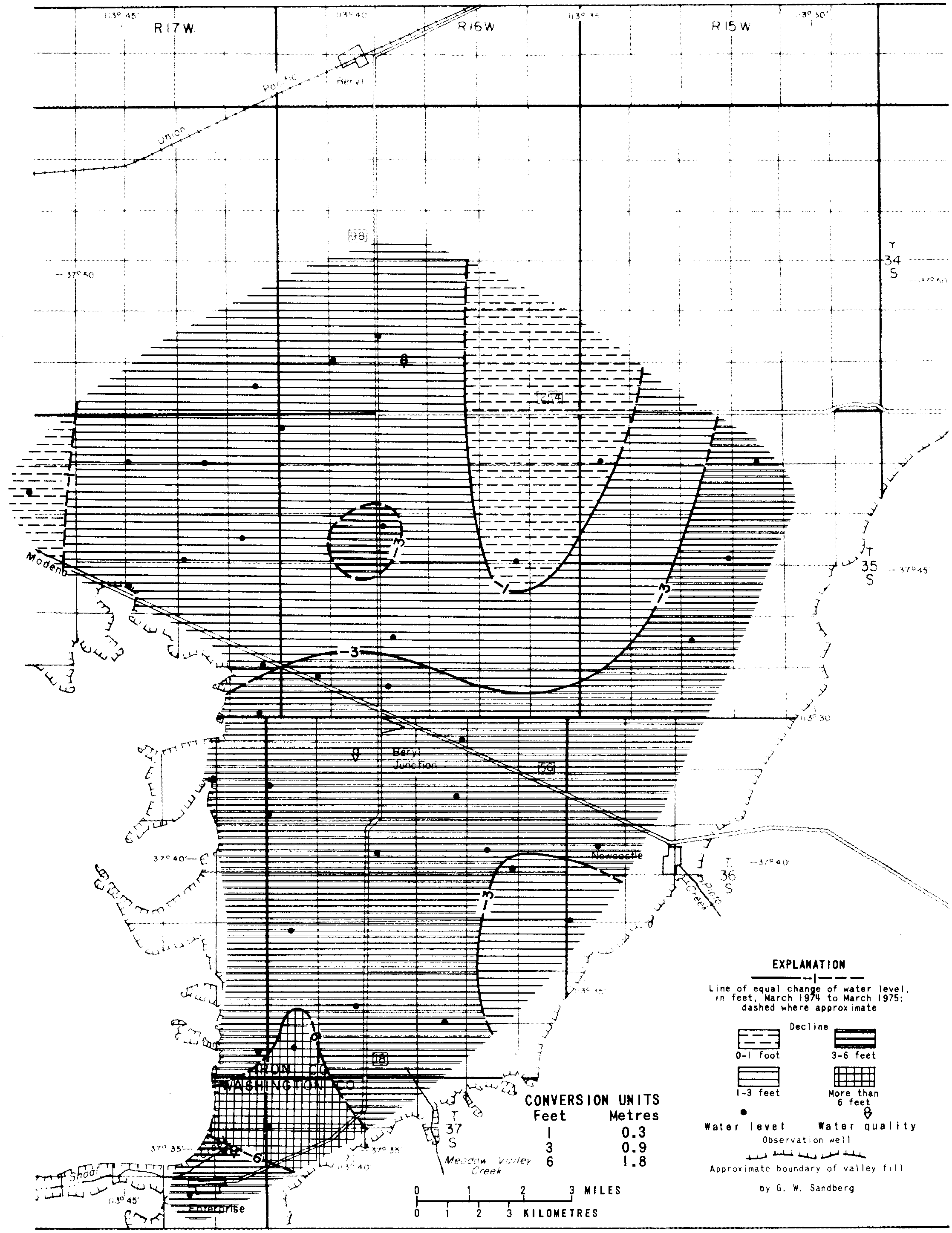


Figure 34.— Map of the Beryl-Enterprise area, Escalante Valley, showing change of water levels from March 1974 to March 1975.

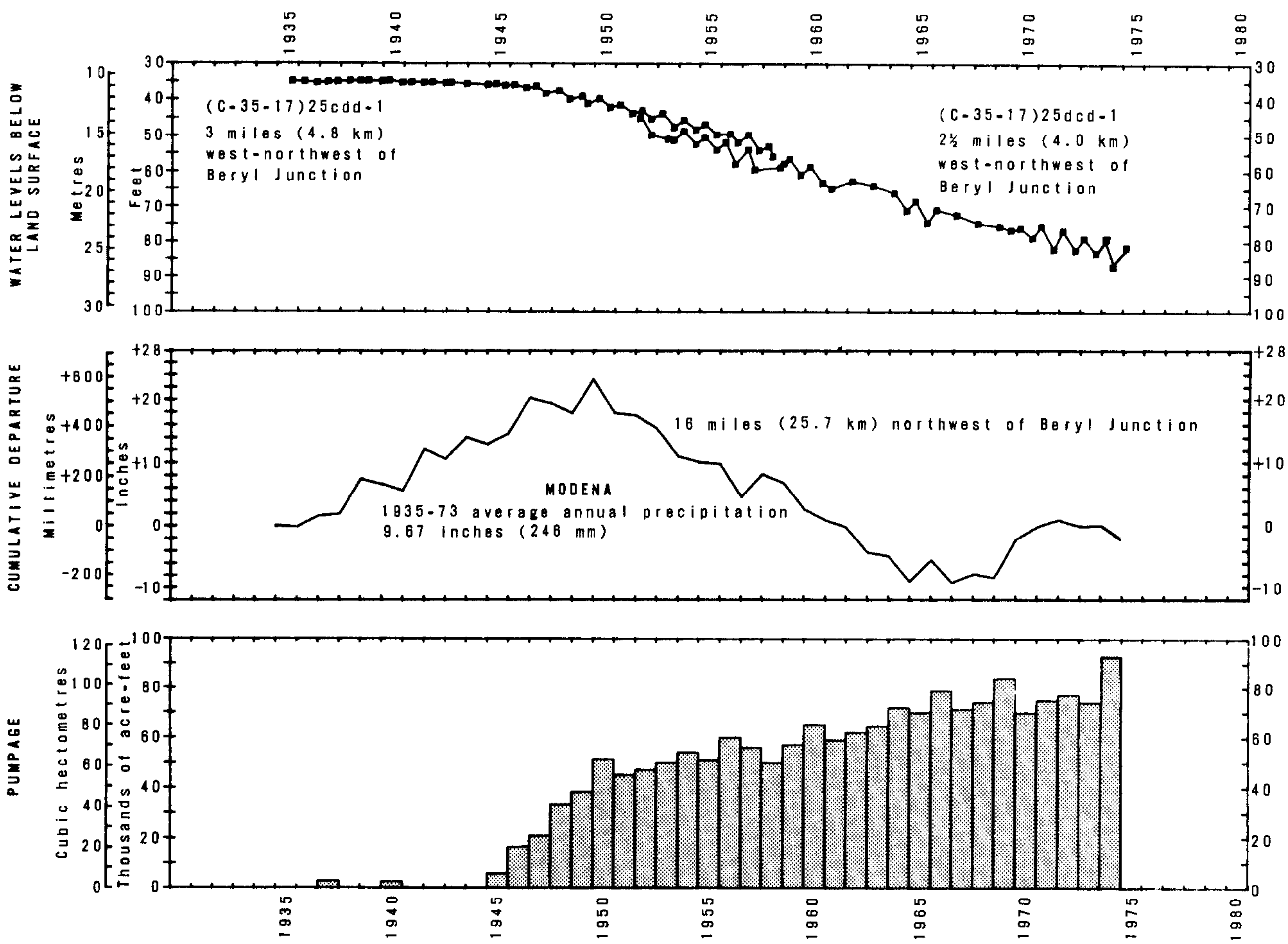


Figure 35.— Relation of water levels in selected wells in the Beryl-Enterprise area, Escalante Valley, to cumulative departure from the average annual precipitation at Modena and to pumpage for irrigation.

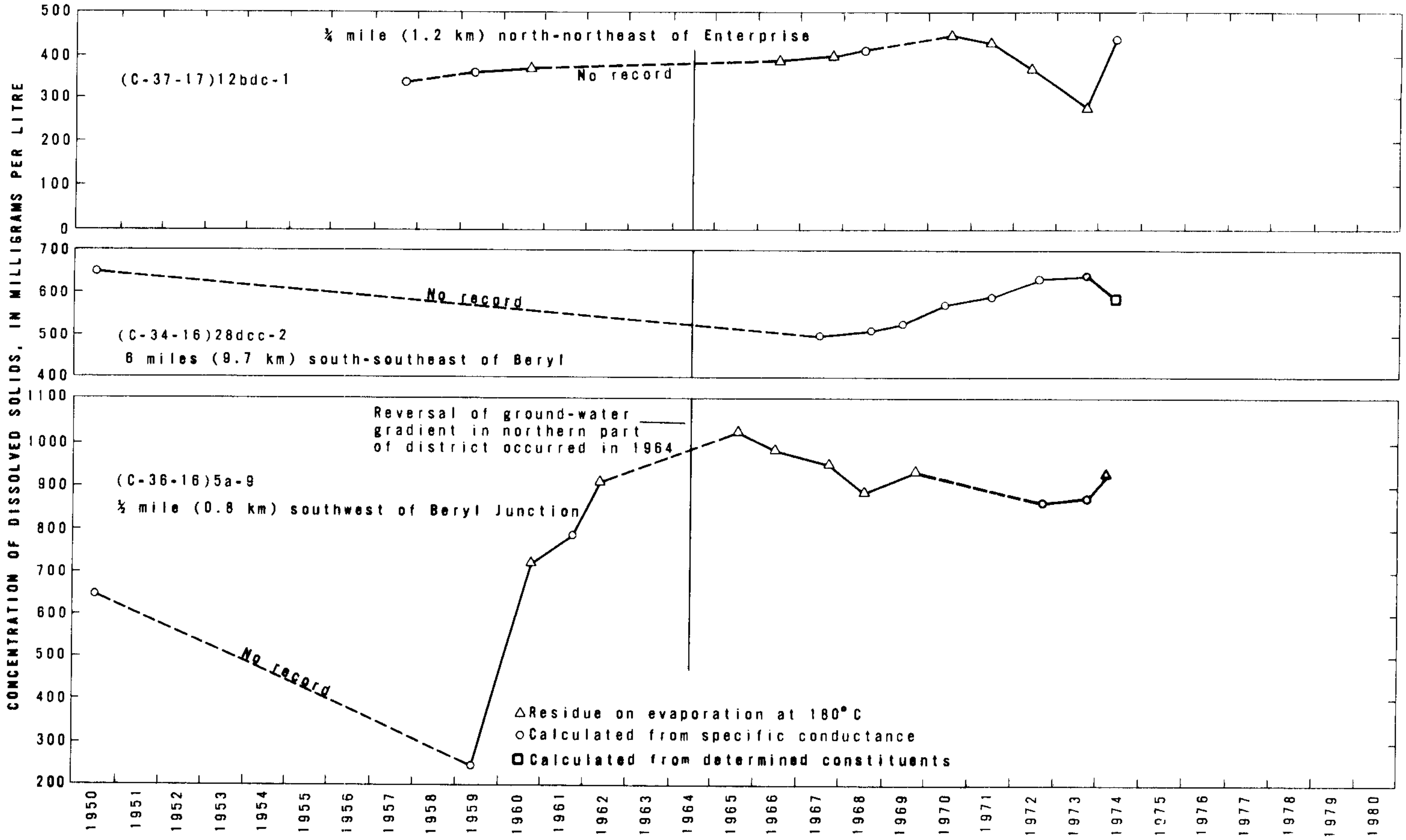


Figure 36.— Concentration of dissolved solids in water from selected wells in the Beryl-Enterprise area, Escalante Valley.

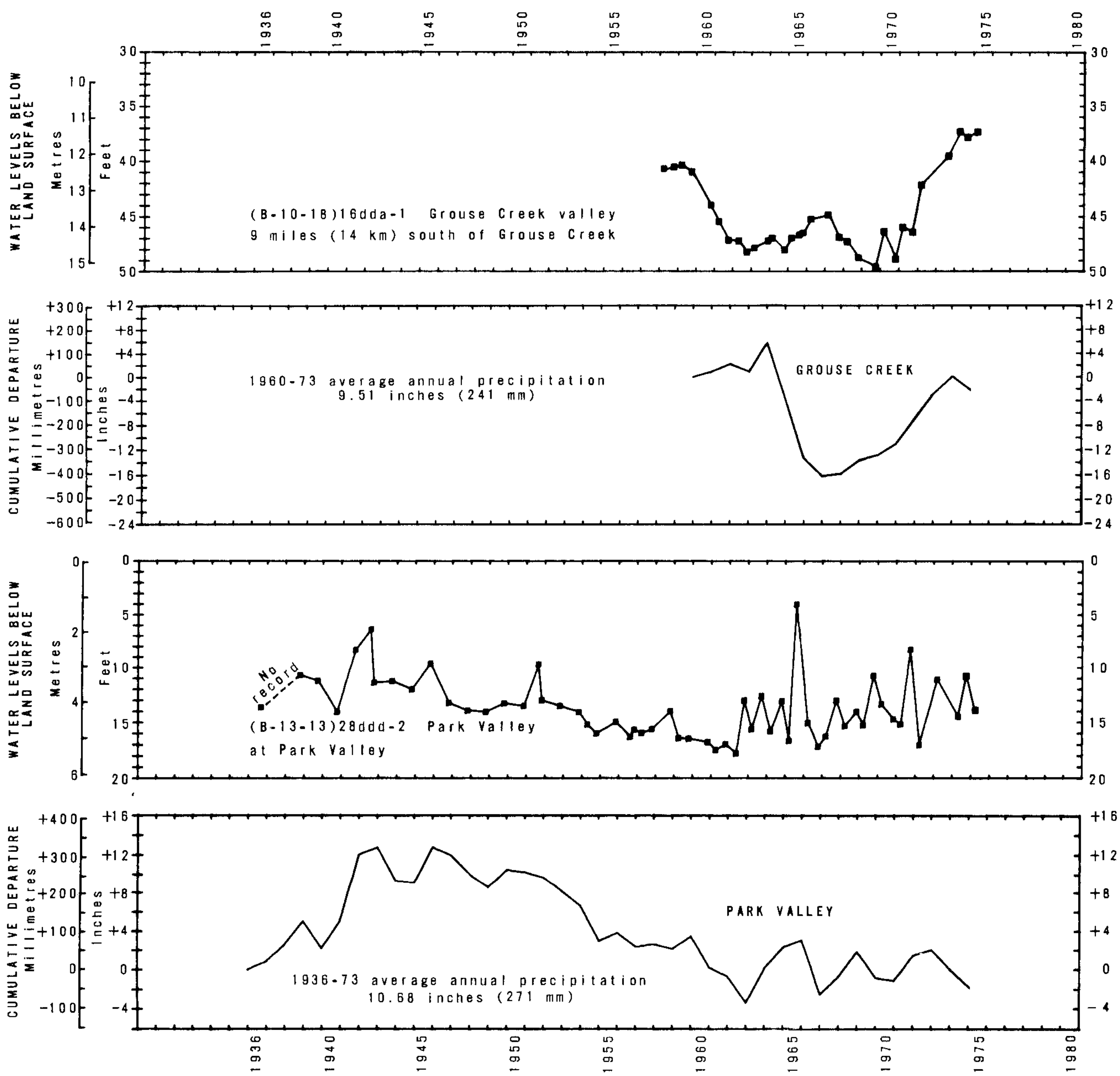


Figure 37.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas.

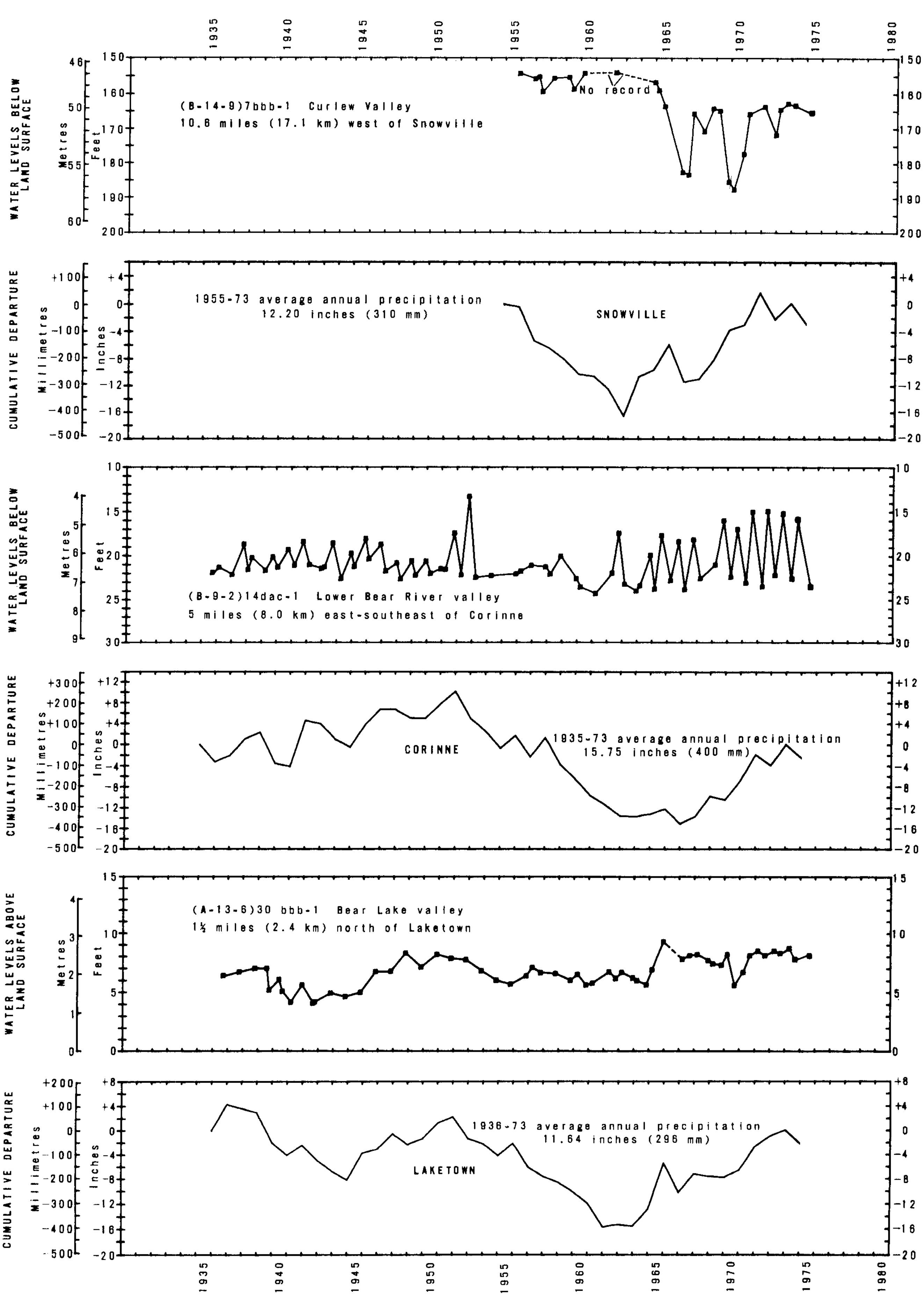


Figure 37.— Continued.

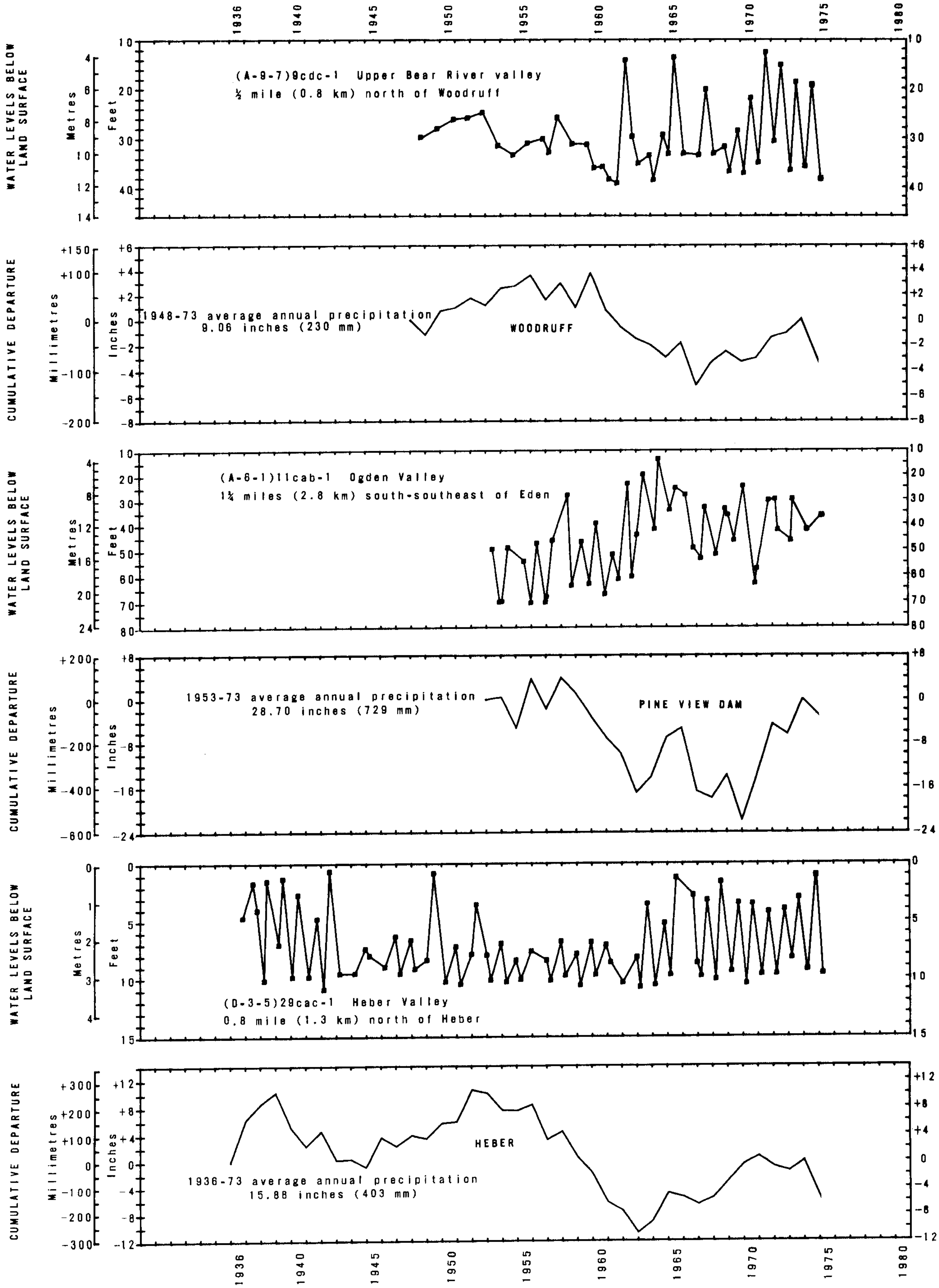


Figure 37.— Continued.

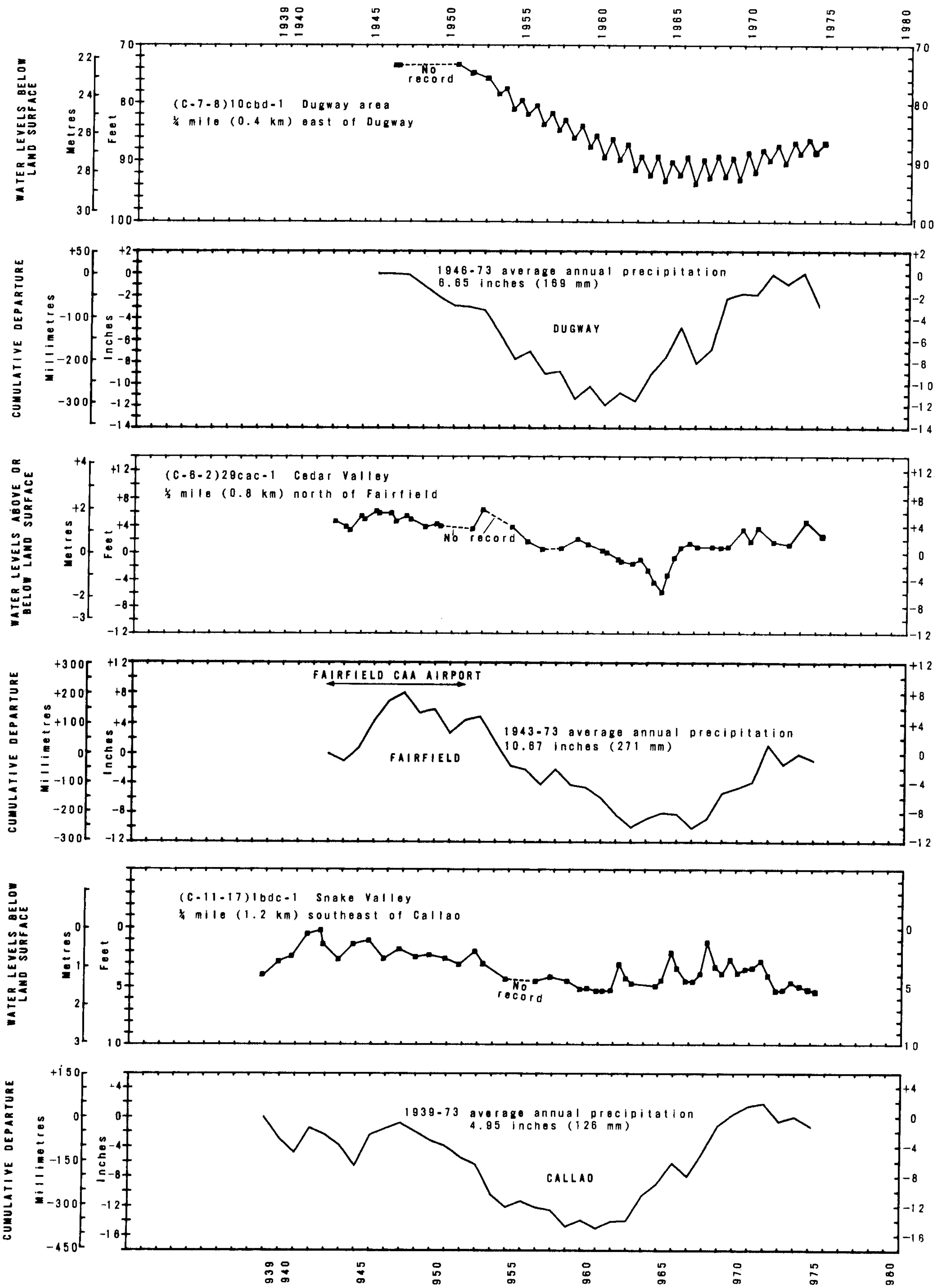


Figure 37.— Continued.

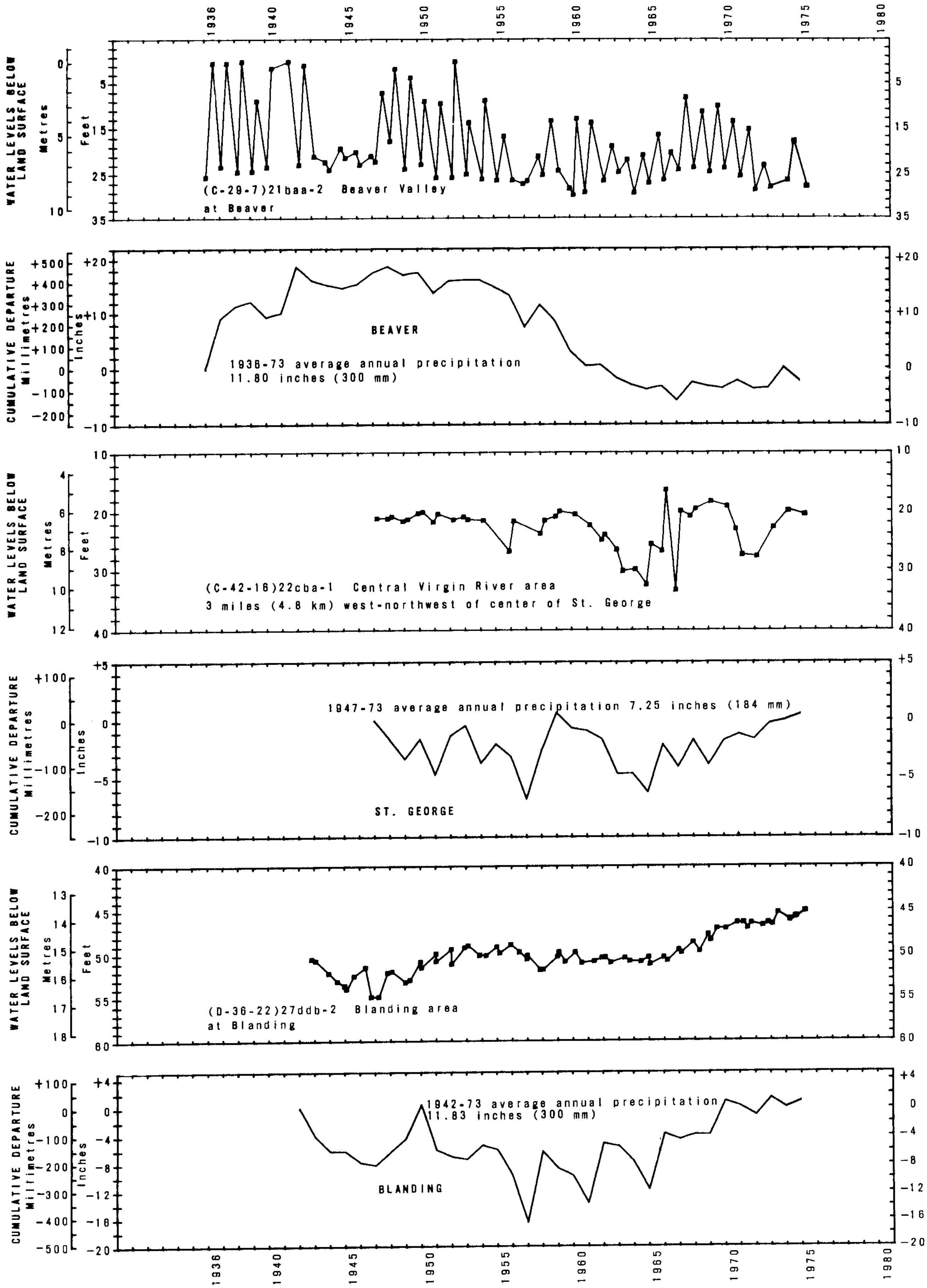


Figure 37.—Continued.

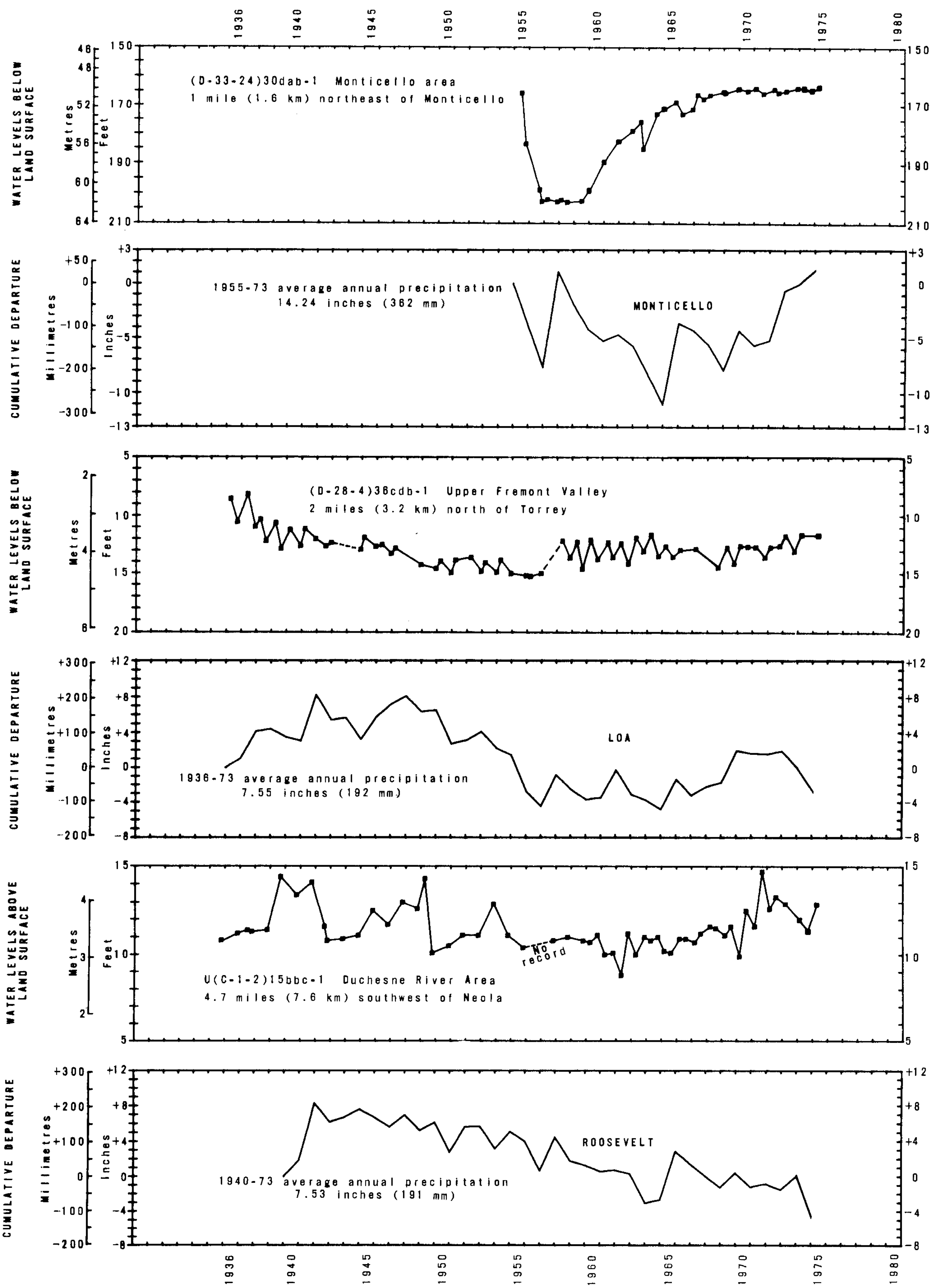


Figure 37.— Continued.

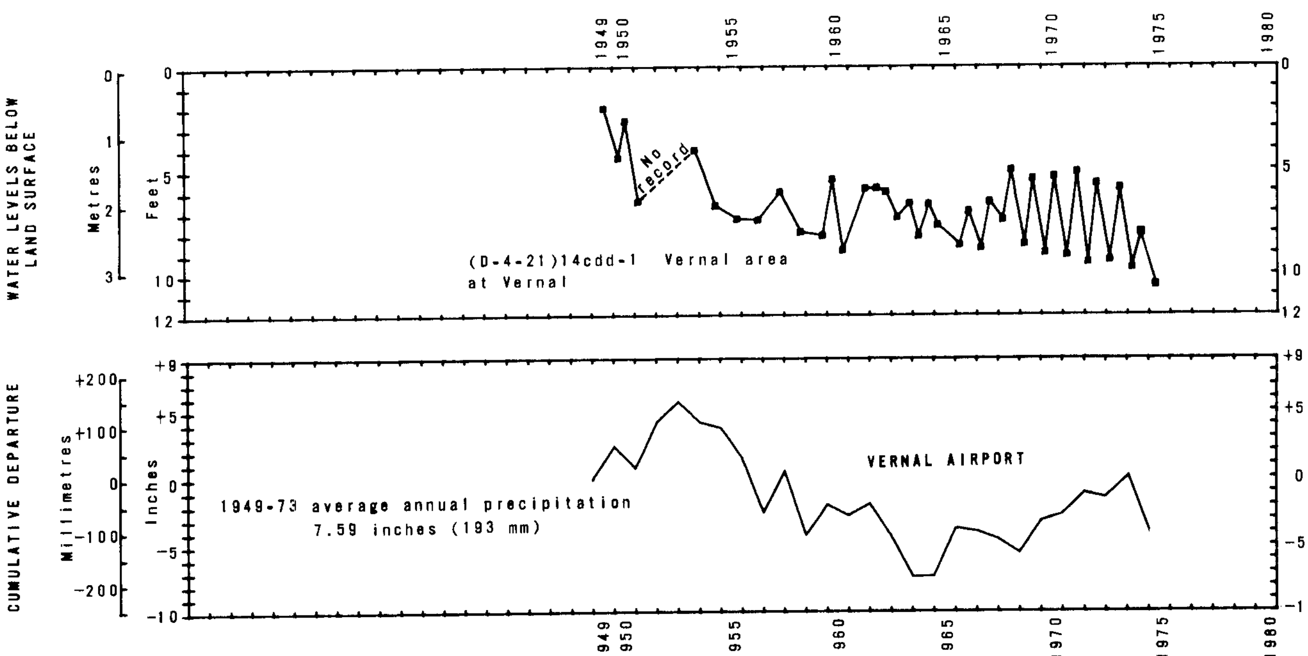


Figure 37.— Continued.